FALCON 3.0

F L I G H T   M A N U A L

Spectrum HoloByte®

Program Credits

Original Design Concept:
Gilman "Chopstick" Louie

Simulation Team:
Erick "Jetbuster" Jap
Gary "RC" Stottlemyer
Kuswara "Porkchop" Pranawahadi
Les "Vulture" Watts

Interface Team:
Scot "Woof" Bayless
Michael "Papa Bear" Mancuso
Ian "Blue Macaw" Falicov
Daniel "Bullfrog" Deremiah

Additional Programming:
Farah "Stinger" Soebrata
Don "Blaster" Harlow
Rebecca "Stormtrooper" Ang
Donald "Cal" Tsang
Lee "Vaporizer" Powell

Product Manager:
Scot "Woof" Bayless

Art:
Matt "Mack Daddy" Carlström
Dan "Dolphin" Guerra
Chuck "Bunhead" Butler
Louis "Cantoni" Sremac
Zachary "Defiant" Fuller

**Animation Direction, Special Effects
and Camera:**
Matt "Mack Daddy" Carlström
Zachary "Defiant" Fuller

Digital Actors:
"Smokin' Joe" Ward
Scot "Woof" Bayless
Russel "Blue Jay" Reiss
Matt "Mack Daddy" Carlström
Zachary "Defiant" Fuller
Tony Beccia
Daniel "Bullfrog" Deremiah
Marisa "No. 19" Ong
Bill Hall
Elizabeth Chambers
Shannon Lee

Stunt Effects:
Matt "Mack Daddy" Carlström
Elizabeth Chambers

World Building:
Anthony "KnötHead" Chiang
Daniel "Bullfrog" Deremiah
"Smokin' Joe" Ward
Peter "Bandit" Ward
Eric "Violator" Grotke
Bradd "Bluto" Huddle

Sound and Music:
Paul "Moggy" Mogg

Quality Assurance:
Kurt "Goat Killer" Boutin
Brett "Flying Crip" Amick
Steve "Scorpion" Blankenship
Stephen "Buster" Keith
Lawrence "Hairball" Kevin
Mike "Mad Mongoose" Nebeker
Russel "Blue Jay" Reiss

Additional Quality Assurance:

Evan "Baron" Birkby

Eric "Cerebus" Chin

William "T-Square" Chin

Mike "Izzy" Isgur

Douglas "Opus" Lin

David "Wotan" Wessman

Beta Testers:

Frank "Turk" Bartolotta

Tom "KC" Basham

Terry "Pinecone" Carraway

James "Hawk" Cook

Alvin "Moondog" Dickerson

Matt "Mythman" Dimmic

Steve "Auger" Edwards

Mark "Endo" Estephanian

Mike "Black Viper" Hartmann

Buzz "Ballistic" Hoffman

Eric "Reckless" Pearson

Dave "Lawman" Reichlein

Donald "Blue Max" Rinker

Kevin "Thrusty" Turner

Michael "Misha" Vario

Steve "FT" Wartofsky

Mike "Moondawg" Weksler

Manual Credits

Writing:

Robert "Spaceman" Giedt

Howard "Whiplash" Bornstein

Pete "Boomer" Bonanni

Kyle "Bulldog" Brink

"Smokin' Joe" Ward

Steve "White Knight" Perrin

Editing:

Robert "Spaceman" Giedt

Marisa "No. 19" Ong

"Smokin' Joe" Ward

Kyle "Bulldog" Brink

Maggie "Milagro" Brown

Technical Illustrations:

Chuck "Bunhead" Butler
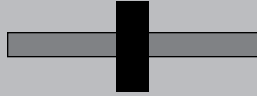
Layout:

Van Winkle Design Group

Photos Courtesy of:

Armed Forces Journal

Aviation Week

General Dynamics

U.S. Department of Defense

Pete Bonanni

Gilman Louie

Dick Stamm

INTRODUCTION

Introduction

Strapped into your seat, you scan the Iraqi landscape for bogeys. Nothing. Martyrs' Bridge ought to be easy to take out. Suddenly, a high-pitched warning screeches at you. Your radar lights up like Times Square on the First. "2 bogeys at 11, 30 miles," you radio to your wingman, almost shouting. "Roger, moving to intercept," he responds. A quick check of the threat indicator shows they haven't spotted you yet since they're not breaking off. You and your wingie break combat spread, swing wide and try to pince them from the rear. Just before you attack, they catch your radar and break off. "Get 'em!" you yell, firing off a burst of rounds at the leader as he zips by while your wingie takes off after the other bandit.

Getting a closer look, your heart leaps into your throat as you notice that these planes are fast and lethal MiG-29s. Muttering sighs of relief that their radar didn't spot you first, you break hard after the leader. He pulls up into a roll, and you follow keeping your energy high, then break down just after he makes his descent. Dead in your sights, you select and arm a Sidewinder, then fire it in his direction. Like he knew it was coming, the MiG dives fast to avoid the missile, dumping flares, and then pulls up hard. Your shallow dive catches him with his energy depleted, so you switch to guns and lay into him. Flames erupt from his engine and flak rains from his wounded bird. Spiraling downward toward the Tigris, the MiG pilot ejects just before his plane shatters like a used firecracker. The other MiG sees his comrade go down and bugs out towards Baghdad. During this time your wingman got shot up and a dirty smear on his tail says that he's got one helluva fuel leak. "I'm a dot," your wingie yells, pulling back and heading for home. "Roger," you reply. Only four more miles to that bridge. Gotta go for it.

You drop to 2,000 feet to avoid radar — then home in on the bridge. "If those Iraqi tanks get there before me, Army's gonna have my head." Two miles to target, approaching visual. Martyrs' Bridge comes into range, and you click to your GBU. Target lock, FIRE! The bomb glides through the air and slams into the center of the bridge, turning it into a hulk of twisted metal. As you wing around and head for home, you're already thinking ahead to your next assignment…

Welcome to the world of *Falcon 3.0,* the most complete and accurate flight simulator on the market today. Strap yourself in and prepare for combat!

About *Falcon® 3.0*™

Falcon 3.0 is first and foremost a simulator of the F-16 Fighting Falcon — a dogfighting aircraft with the additional capability of air-to-ground bombing. It is not only one of the most maneuverable (and inexpensive) planes in the United States' arsenal of aircraft, but it's also a favorite of experienced combat pilots. *Falcon 3.0* has been designed to provide the most authentic simulation of air combat possible on your computer.

Inside *Falcon 3.0* are actually three games in one: the Instant Action mode for the novice flight sim pilot, the Red Flag training ground/mission editor where budding pilots can prepare for combat, and the Campaign mode in which you take the part of a squadron commander and lead your pilots to victory or defeat on one of three real-world battlefields.

Instant Action is designed for the novice pilot or the player who is interested in "mixing it up" without a lot of complexity. All you've got in this mode is your F-16 and lots of enemies. Instant Action can also serve as basic training for the simulation; you can learn how to fly and observe the characteristics of the various enemy aircraft. You will be scored based on the number of air and ground targets destroyed and the accuracy of the weapons you fired. Instant Action is fully described in **Section II: Instant Action**.

One feature of Red Flag is the set of training lessons described in **Section VI: Air Combat School**. These lessons will lead you through the operation of your F-16, from basic flight to air combat maneuvers. They also cover the operation of the aircraft's avionic and weapon systems. Another feature of Red Flag is the mission editor which allows you to create your own missions involving a great variety of air and ground forces.

The Campaign is the heart of *Falcon 3.0.* In the Campaign, you play the role of a squadron commander in one of three theaters of conflict: Panama, Israel or Kuwait. You assign the pilots of your squadron to various missions to achieve victory. You also take the role of the lead pilot on all missions; your skills determine the outcome of every mission and eventually the outcome of the war. The computer controls your wingmen and the overall course of the conflict. The progress of the campaign is strongly influenced by your success or failure on the battlefield, so no two campaigns will ever be exactly alike.

In addition to the three major modes of play described above, *Falcon 3.0* has other features: ACMI (Air Combat Maneuvering Instrumentation), which allows you to record and review mission action, a Configuration section for customizing game features, and a Communications mode that allows you to battle your friends head-to-head using a modem, network or a direct connection.

How to approach this manual

Don't worry about the length of this book — by no means do you need to read it all to experience the thrill of *Falcon 3.0*. While a lot of the manual describes how to play the game, not every section needs to be tackled at once.

Before continuing with this manual, you should turn to **Section III: Installation and Loading** and read the Installation and Loading procedures. This section will explain where to find the Install program and how it operates. It will tell you how to load the game and configure your system to utilize expanded memory (EMS).

Next, you should turn to **Section IV: War Room,** which gives a brief overview of *Falcon 3.0's* interface and describes how to get to the various areas of the game. From the War Room, you can choose to fly around in Instant Action (**Section II**), to change some of the hardware or software options for the game (**Section X**), or to edit one of your squadrons (**Section V**). After setting up a squadron, you can either go on a training mission (**Section VI**) or begin a new campaign (**Section VIII**).

INSTANT ACTION

Instant Action

Instant Action puts you into the air immediately. No setup, no required objectives, no hassle — just straight piloting.

If you haven't already installed *Falcon 3.0,* install it according to the directions in **Section III: Installation and Loading**. To enter Instant Action, load *Falcon 3.0*. You will see an introductory sequence followed by the title screen and game credits.

Welcome to the War Room

The screen that follows is the War Room. Using the keyboard or the mouse, you can access other sections of the game by selecting one of the various monitors in the War Room.

If you have gone to the Configuration area before, go there now, select the Beginner button and return. If you want to adjust the settings to make it more difficult or more realistic, please see **Section X: Configuration** for full instructions.

If you have never gone to the Configuration screen before, don't worry; you'll automatically start at the Beginner setting.

Selecting the large screen at the upper left of the War Room exits you to DOS; selecting the large monitor at the upper right launches you straight into Instant Action.

Zero to 450 in six seconds

After some video animations, you will find yourself airborne, cruising at 450 knots directly over an enemy ground installation.

Start fighting — you're on your own, with unlimited fuel, weapons and time. Every radar contact is hostile, every dot on the horizon is the enemy, and everything on the ground wants you shot down. The goal is simple: see how long you can last and how many of them you can take with you before you buy the farm.

Time out!

The game can be paused by pressing [P]. A paused game can be restarted the same way.

Pressing [Esc] will also halt the game as well as bring up the menu bar. A number of options, discussed in **Section IX: Flight**, are available through the various menu selections. Return to play by pulling down the FILE menu and selecting Return to Game.

Controlling the plane

The **Quick Reference Card** has a full keyboard command listing, but here are the basics.
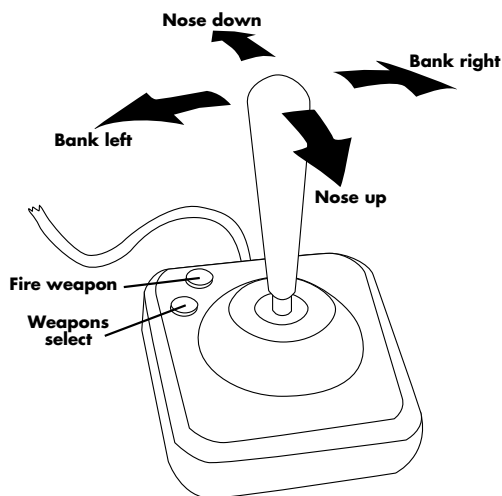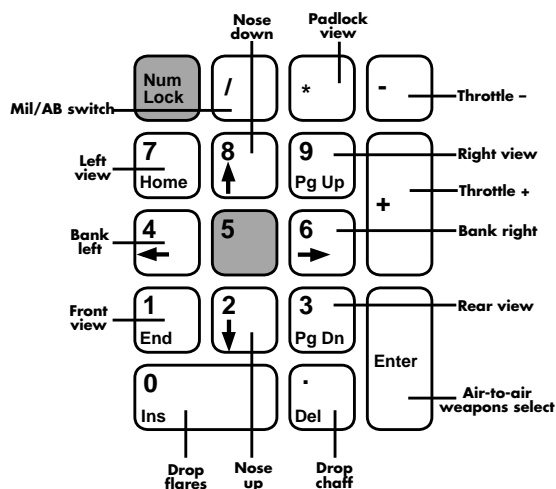
To bank left or right, just push the stick to that side. Pull back on the stick to climb, and push forward on the stick to dive. Pull back and bank simultaneously to turn tighter. If you are using the keyboard, the arrow keys take the place of the stick.

Control the throttle with [+] and [−]. Watch the RPM Indicator on the right side of the cockpit as you increase and decrease the power; for dogfighting, 60%–80% power is optimum. But if you need to extend or are just plain out of airspeed, kick in the afterburners with [/]. When you first fire the 'burners, you will see "AB1" displayed in the MIL/AB Indicator, next to the RPM Indicator. This means you are in the first stage of afterburner. Use [<] and [>] to scale through the five afterburner stages. Shut down the afterburners with [/].

The Head-Up Display (HUD)

G Force
Indicator

Pitch
Ladder

Aiming
Reticle

Airspeed

Mach
Indicator

HUD Mode
Indicator

Altitude
Above
Sea Level

Heading

Range
to Target

Closure
Rate

Distance to
Waypoint

Altitude Above
Ground
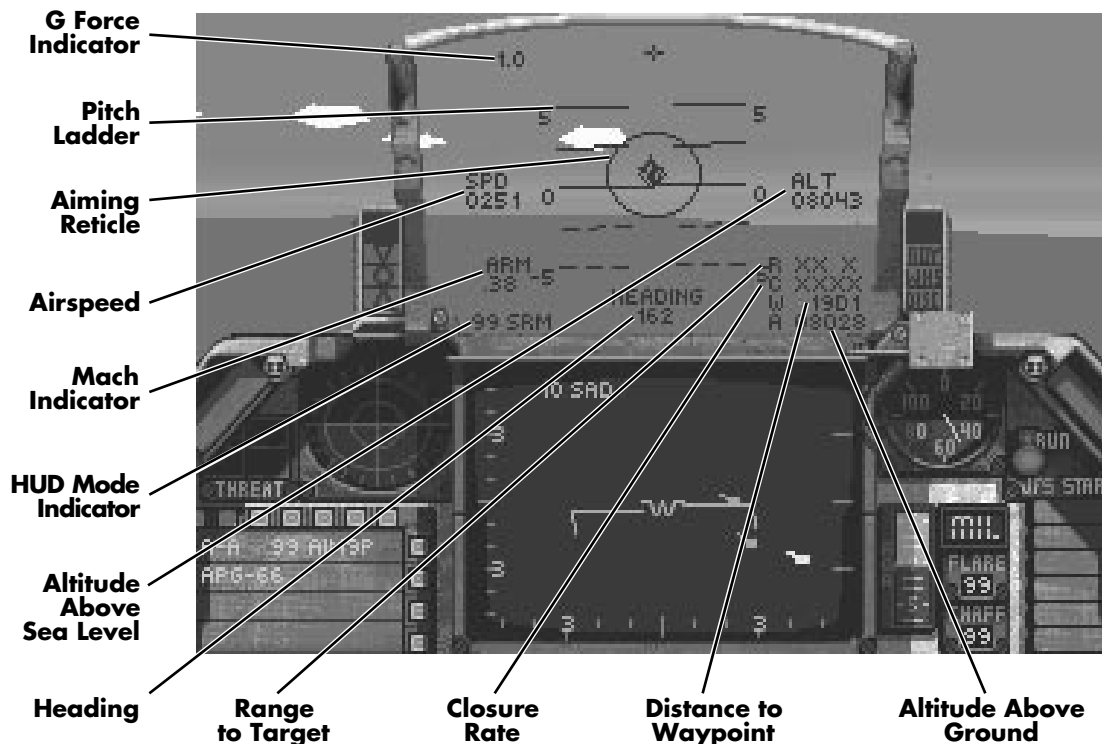
Pause the game for a moment. Now look at the center of your screen, where all the green writing is. The area within this metal frame is the HUD.

The symbols

The tiny circle in the center is the Center Point; its purpose is to help keep the pilot's attention focused in chaotic situations.

The larger circle around the Center Point is the Aiming Reticle. In general, any target within the aiming reticle has a good chance of being hit, assuming it is in range and you are locked on. Within the Aiming Reticle, a number of different targeting aids may appear. These will be discussed later.

Overlaid on the Aiming Reticle is the Pitch Ladder, a wide band of lines with numbers next to them. The lines are parallel to the horizon, and the numbers at either end indicate the plane's pitch in degrees. Zero degrees is parallel to the ground, 90 degrees is pointing straight up, and -90 degrees is pointing straight down.

At the top of the HUD is the plus sign. If an air-to-air target is within visual range, a line will extend from the plus sign in the direction of the selected target.

The figures

Centered in the bottom of the HUD is your current heading in degrees, where 000 is due north, 090 is due east, 180 is due south and 270 is due west. Next to the heading will be the Waypoint Caret which tells you which way to turn to head to your next waypoint. For example, if the heading read "270>," you should bank to the right to reach your next waypoint. When you are heading directly towards your waypoint, the Waypoint Caret will read ">xxx<."

Next to the heading, in the lower right-hand corner of the HUD, are four numbers. The top one is the range to the current target in feet. The next is the closure rate — your speed relative to the target. If your closure rate is positive, then you are approaching your target at that speed (in knots). If it is negative, then your target is pulling away at that rate. The third number is the distance to the next waypoint. The bottom number is your altitude above terrain, which shows how high above the dirt you are.

Above the range figure, at the middle of the right-hand side of the HUD, is your altitude in feet. This is how high above sea level you are — not how far above terrain your plane is.

At the top left of the HUD is a number indicating how many Gs you are pulling and whether they are negative or positive. This is only of concern if you are playing with Redout/Blackout active (see **Section X: Configuration**).

The number displayed below the G readout, about the midpoint of the left side of the HUD, is your airspeed in knots.

The Mach Indicator (a number with a decimal point) is below. This is your speed in Mach numbers; 1.0 is equal to the speed of sound, 2.0 is twice the speed of sound, and so on.

Below the Mach indicator is the number "99" followed by a three- or four-letter code. The number "99" indicates that you have unlimited armament; the letter code indicates what HUD mode you are in. The HUD mode automatically changes when a new weapons system is selected. The various modes (CCIP, DGFT, ILS, SRM, STRF and so on) are explained in detail in **Section IX: Flight**.

How to shoot

The Stores Control Panel in the lower left-hand corner of your Front View shows what weapons mode you are in, either "A-A" (Air-to-Air) or "A-G" (Air-to-Ground). If you are in A-A mode, press Backspace to switch to A-G; in A-G mode, press Enter to switch to A-A. The panel also shows which weapons system is currently active. In A-G mode, Backspace will cycle through the various air-to-ground weapons. If you are in A-A mode, cycle through the air-to-air weapons by pressing Enter.

Target
Diamond
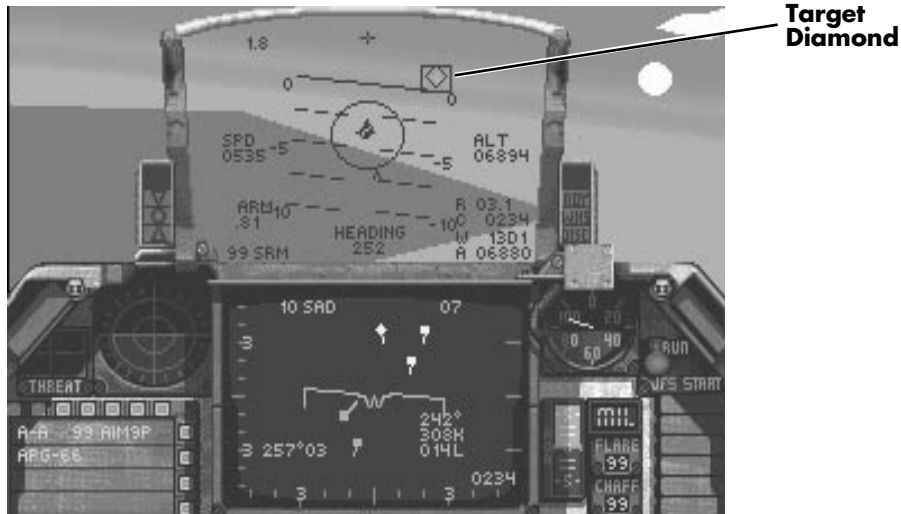
In A-A mode with any of the missiles selected, a diamond will appear within the Aiming Reticle. This shows where the missile is seeking. When an enemy enters the Aiming Reticle and is within visual range, the missile will automatically lock on and the Aiming Reticle will flash as long as the lock is maintained. Hit [Spacebar] to fire the missile.

Gun
Funnel
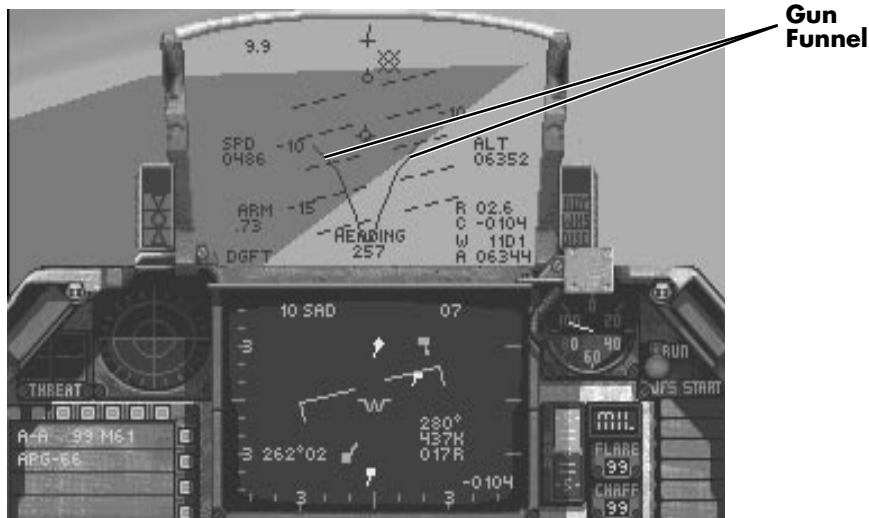
In A-A mode with the M61A1 gun active, a pair of lines will appear within the Aiming Reticle. As you maneuver, these lines will curve and sweep up or down, forming what is known as the funnel. The point of the funnel, where the two lines meet, is where shells from the gun will arrive. A good rule of thumb for ranging and accuracy: if both of the target's wingtips touch the sides of the funnel, it is within range and likely to be hit. Hit [Spacebar] to fire.
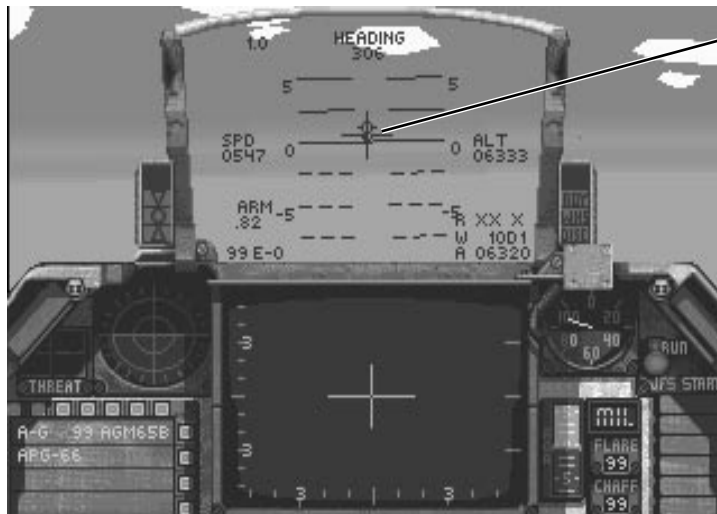
Cross Hairs

In A-G mode with AGM-65Bs, AGM-65Ds or GBU-15s selected, cross hairs will appear in the middle of the Aiming Reticle. When a target enters the Aiming Reticle, the cross hairs will automatically lock on and follow the target. Press [Spacebar] to fire.

Bombsight

In A-G mode with LAUs or with the gun selected, the bombsight (a targeting dot with a circle around it) will appear near the Center Point. When the dot is on the target, press [Spacebar] to fire.

Bombsight

With all other A-G weapons, weapons delivery requires two actions: designating the target and releasing the weapon. A bombsight similar to that used for the gun and LAU rockets will appear with a line extending upwards from the targeting dot. When the target is in the targeting circle at the base of the line, hit [Spacebar] once. This designates the target, identifying it for the on-board bombing computer. If you continue flying over the target, the computer will automatically release the bomb at the correct time to strike the target you selected. Or you can release it yourself by pressing [Spacebar] any time after designating. Pressing [Spacebar] twice quickly will release a bomb immediately.

The radar

Below the HUD is the Radar/Electro-Optical (REO) Display. This is where the various radar and weapons guidance systems display their information. There are two REO Display modes; one is for air-to-air combat, and one is for air-to-ground.

Radar Scale — Target's Altitude — Waterline — Target's Heading — Target's Airspeed — Closure Rate — Target's Aspect Angle

In air-to-air mode, your plane's position will be in the center of the REO display. Any plane above the center will be in front of you, and any plane below the REO's center will be behind you. The long green line across the center is called the waterline and shows your roll (your plane's left-right tilt in relationship to the ground). The ends of the waterline bend toward the ground to aid in orientation.

In the upper left corner is a number followed by the letters "SAD" (Situation Awareness Display). The number shows the scale of the display. The number "20," for example, means that it is 20 miles from the top of the display to the waterline. The scale will automatically change as necessary.

In the upper right corner of the REO Display is a two-digit number. This is the enemy's altitude in thousands of feet.

Near the lower right corner of the A-A REO Display are three numbers. The top one is the target's heading in degrees, the middle one is the target's airspeed in knots, and the bottom one is the aspect angle to the target. Aspect angle is covered in **Section VI: Air Combat School**.

In the very bottom of the right side is the closure rate, which is also displayed in the HUD.

If you have any radar contacts, they will be shown on your REO Display. The target you are tracking will show up as a diamond; any other contacts will be displayed as squares. The color of the square or diamond indicates the contact's relative altitude as compared to your F-16's altitude:

♣ Orange targets are more than 3,000 feet below you.

♣ White targets are within 3,000 feet of you in altitude.

♣ Blue targets are over 3,000 feet above you.

The line extending outward behind each radar contact shows the contact's direction of travel. To track a different target, press T.

In air-to-ground mode, Maverick missiles and GBUs use the REO to display a video picture from their target acquisition sensors. When you have selected either of these weapons, the REO will display a set of cross hairs and video of any targets picked up by the sensor.

Using the Threat Warning System

The circular screen to the left of the REO Display is the Threat Warning Indicator. Any enemy with active radar will show up as a blip on this screen. The screen is divided by two lines. Anything above the horizontal line is in front of your plane, and everything below the line is behind you. The shape of the blip indicates what is emitting the radar signals: diamonds are enemy aircraft, large squares are enemy surface-to-air missiles, and small squares are air-to-air missiles in flight. The numbers inside the blips indicate the type of radar being used (which is not important in Instant Action).

To the left of the Threat Indicator is the Threat Warning Panel. If enemy radar locks onto your plane, the "LCK" light will come on. If a missile is launched at you, the "LNH" light will warn you.

Have a look around

You have many different views to help you see your adversaries and your position. Select these views by pressing the number keys $\boxed{1}$ through $\boxed{0}$ or $\boxed{End}$, $\boxed{Pg\ Dn}$, $\boxed{Home}$, and $\boxed{Pg\ Up}$ ($\boxed{1}$, $\boxed{3}$, $\boxed{7}$ and $\boxed{9}$ on the numeric keypad).

In all five outside views, $\boxed{F1}$ will zoom in, $\boxed{F2}$ will zoom out and $\boxed{F3}$ and $\boxed{F4}$ will rotate the image.

Press $\boxed{1}$ to switch to Satellite View, which shows your plane from above.

Press $\boxed{2}$ to switch to Ground View, which shows your plane from below.

Press $\boxed{7}$ to switch to the Wingman View, which is not active because you are on your own in Instant Action.

Switch to Track View by pressing $\boxed{9}$. This shows your plane from behind if no enemies are in view. If enemies are in sight, the view will always keep the target and your plane visible at the same time. Also, if you've got a missile coming inbound, this view will keep it in sight.

The Chase View also shows your plane from behind, but as if the camera were chasing you — it lags behind your maneuvers slightly, whereas the tracking view does not. Press $\boxed{0}$ (zero) to switch to the chase plane view.

Select the Left View from the cockpit by pressing $\boxed{Home}$ ($\boxed{7}$ on the numeric keypad) or $\boxed{4}$. Switch to the Right View by pressing $\boxed{Pg\ Up}$ ($\boxed{9}$ on the numeric keypad) or $\boxed{6}$. Check your six, or Rear View, by pressing $\boxed{Pg\ Dn}$ ($\boxed{3}$ on the numeric keypad) or $\boxed{5}$.

Press $\boxed{End}$ ($\boxed{1}$ on the numeric keypad) to return to the Front View.

Level advancement

After you destroy a certain number of enemy aircraft, you will automatically advance to the next level of Instant Action play. Every enemy pilot in this new wave of aircraft will have an Enemy Logic Level set one higher than what you selected in the Configuration screen. (For example, if you had Enemy Logic Level set to VETERAN in the Configuration screen, the next wave of aircraft will have Ace pilots.) After the Ace aircraft wave, all pilots in subsequent logic level are set to Ace.

Scoring

Instant Action is the only part of *Falcon 3.0* in which a score is kept. The score for destroying any air or ground target is determined by the difficulty of the feat. The skill, the aircraft and the weapons of a defeated pilot all add up to determine the point value of a dogfight victory. In addition, the presence of multiple bogeys in the area will increase the value of both air and ground targets. Although you have been given unlimited weapons, every missile fired and every bomb dropped subtracts from your point total. Then, your base score will be multiplied based on your realism setting in the Configuration area. So, if you want a high score, don't waste your weapons. This is good practice for the campaign anyway, since every weapon will be precious at the higher levels of realism.

To erase the Instant Action high scores list, simply erase the file TOPTEN from your FALCON3 directory. Type **del topten** Enter at the DOS prompt.

Good luck and watch your six!

INSTALLATION AND LOADING

Installation and Loading introduction

Please read this chapter for instructions on how to install and load *Falcon 3.0.* In addition, if you have any trouble getting the game to run, please refer to the troubleshooting section at the end of this section.

Contents of the package

Your *Falcon 3.0* package should contain:

✦ *Falcon 3.0* CD-ROM

✦ *Falcon 3.0* Flight Manual

✦ *Falcon 3.0* Quick Reference Card

System requirements

The minimum system requirements for *Falcon 3.0* are:

✦ IBM PC 80386 or 80486 compatible

✦ 1MB RAM

✦ 602K (616,448 bytes) of free conventional memory

✦ DOS 5.0 or later

✦ VGA graphics

✦ CD-ROM drive

✦ Hard drive with 11MB free

We recommend the following:

✦ Joystick, dual joysticks, CH FlightStick Pro, ThrustMaster Flight Control System (FCS) or rudder pedals

✦ ThrustMaster Weapons Control System (WCS)

✦ Mouse

✦ Ad Lib, Sound Blaster, Roland MT-32 or Roland LAPC-1 sound card

✦ 2MB RAM with EMS (expanded memory)

✦ Expanded memory manager, such as EMM 386, QEMM or 386Max

✦ Null-modem serial cable or modem for two-player communications

For optimum performance, you should have the following:

✦ IBM PC 80486 compatible

✦ 4MB RAM with EMS (expanded memory)

✦ 602K (616,448 bytes) of free conventional memory

✦ DOS 5.0 or later

✦ 16-bit VGA graphics

✦ Double-speed CD-ROM drive

✦ Hard drive with 11MB free

✦ Dual joysticks, CH FlightStick Pro with rudder pedals, or ThrustMaster FCS and WCS with rudder pedals

✦ Sound Blaster *and* either a Roland MT-32 or Roland LAPC-1 sound card

How to install

Before starting the installation, please be sure you have the proper CD-ROM software installed on your machine. If you are unsure whether you have the proper software installed on your computer, consult your CD-ROM owner's manual for more information.

Please follow the instructions below only if you are running DOS 5.0 through DOS 6.22. If you are running Windows 95, please refer to the "Compatibility with Windows" section.

1. Insert the *Falcon 3.0* disc in your CD-ROM drive.

2. Type **d:** [Enter] at the DOS prompt. (If your CD-ROM drive is a letter other than D, type that letter instead.)

3. Type **install** [Enter] at the DOS prompt.

4. Click on "View and print Readme" to view the Readme file which contains important last-minute information. Use the mouse or arrow keys to read the entire file. If you wish to print the Readme file for future reference, click the Print Readme button. When you are finished, click the Exit button to return to the main menu.

5. Click on "Install game."

6. Click on "Install standard version." The next screen checks to see if your computer system meets the system requirements for *Falcon 3.0.* The three columns onscreen are a description of the requirement category, the game's requirement and the detected value on your computer. If a system requirement is highlighted in yellow, you will be able to install *Falcon 3.0* but may have problems running it. If a particular requirement is highlighted in red, you cannot install *Falcon 3.0*.

7. If a particular system requirement is highlighted in red, click on "Suggest Fix" for possible solutions on solving the problem.

8. Click the OK button to continue.

9. Select a hard drive from the list in the left window. Make sure you have enough hard drive space (at least 11MB free). Click OK to continue.

10. The next screen allows you to change the destination directory where *Falcon 3.0* will be installed. The default directory is \FALCON3. If you wish to change the path, press the [Backspace] key to erase "\FALCON3" and type in a new name. Otherwise, click the OK button to continue.

11. Click the Install button to confirm that the source drive (your CD-ROM drive), destination drive and destination path are correct.

12. The installer will begin to copy files from the *Falcon 3.0* CD-ROM to your hard drive. The bar in the upper left-hand corner displays the completion percentage of the installation. If you need to stop the installation, click the Abort button.

13. After all the files have been copied to your hard drive, a summary of "suggested fixes" will be displayed as well as instructions on how to load the game.

Configuring your memory

The most common problem in running *Falcon 3.0* is finding enough free conventional memory. Most IBM PC compatible computers come standard with at least 1MB RAM. The first 640K RAM is known as conventional memory. Physical memory above 1MB RAM is known as extended memory. Some of *Falcon 3.0*'s features use expanded memory (EMS). Memory managers (such as EMM386, QEMM or 386Max) can convert extended memory to expanded memory.

Due to the realism and complexities of the game, *Falcon 3.0* requires a lot of free conventional memory to operate: 602K or 616,448 bytes.

If you do not have enough free conventional memory, an error message will be displayed: "Falcon version 3.05 requires 602K (616,448 bytes) of free conventional RAM."

Type **mem** [Enter] at the DOS prompt to see how much free conventional memory you have. The number on the line "largest executable program size" must be at least 616,448 bytes in order to run *Falcon 3.0*.

Finding free memory

To configure your computer with as much available conventional memory as possible, you *must* load DOS high. Check your CONFIG.SYS file to make sure it includes the line "DOS=HIGH,UMB."

A commercial memory manager such as QEMM or 386Max can improve your computer's performance by using less conventional memory. Run your memory manager's optimization program to free up as much conventional memory as possible. If you're using DOS 6.0 or later, type **memmaker** [Enter] at the DOS prompt. If you're using QEMM, type **optimize** [Enter]. If you're using 386Max, type **maximize** [Enter].

Falcon 3.0 will not run if you have any RAM-resident programs (such as RAM disks, DOS shells, print spoolers, etc.) running in the background. You can try loading them into high memory instead of conventional memory. You can also temporarily disable them by temporarily modifying your AUTOEXEC.BAT and CONFIG.SYS files so they do not load TSRs.

Creating a boot disk

If you are still having problems freeing up enough conventional memory, the simplest solution is to create a special floppy disk called a "boot disk." Use this disk to configure your computer when you turn it on. The boot disk contains versions of your computer's startup files (AUTOEXEC.BAT and CONFIG.SYS) that will work with *Falcon 3.0.* When you are done playing with the games, you can remove the boot disk, restart your computer and return to your original configuration.

If you are running DOS 5.0 through DOS 6.22, we have supplied batch files for different configurations. Before you start, make sure you have a blank floppy disk available.

1. Insert a blank disk into your floppy drive.

2. To create a bootable system disk, type **format a: /s** ⏎Enter at the DOS prompt.

3. Type **cd\falcon3** ⏎Enter to change to your \FALCON3 directory.

4. Type one of the following depending on your computer system:

   bootemm to create a boot disk that configures 1MB of EMS as well as works for Packard Bell and IBM PS/1 computers

   bootmice to create a boot disk that configures 1MB of EMS and loads the mouse driver high

   bootdspc to create a boot disk for a computer running DoubleSpace (not DriveSpace)

   bootnet to create a boot disk that loads the network drivers, IPX and NET5

5. If you are using a software compression driver on your hard drive (such as Stacker or Super Stor), you may need to modify your boot disk. Edit the CONFIG.SYS file on the boot disk to include the device driver and load it high with the Devicehigh command. Consult the manual for your software compression utility if you need further instructions on how to load the driver into high memory.

6. To use your boot disk, turn off your computer, insert the boot disk into the floppy drive and then restart your computer.

Boot disk examples

The AUTOEXEC.BAT and CONFIG.SYS files below show examples for different computer configu-
rations if you are running DOS 5.0 through DOS 6.22.

For mouse, 1MB EMS and EMM386:

AUTOEXEC.BAT
```
prompt $p$g
path c:\dos;c:\cd
lh c:\mouse\mouse
```

CONFIG.SYS
```
device=c:\dos\himem.sys
device=c:\dos\emm386.exe 1024 ram
buffers=30,0
files=30
dos=high,umb
stacks=0,0
```

For QEMM, DoubleSpace, mouse and SCSI:

AUTOEXEC.BAT
```
path c:\dos;c:\qemm;c:\msmouse;c:\utils;c:\bat
prompt $p$g
c:\msmouse\omouse.com (replace with your mouse driver)
```

CONFIG.SYS
```
device=c:\qemm\qemm386.sys ram
dos=high
files=30
buffers=30
stacks=0,0
device=c:\qemm\loadhi.sys c:\dos\dblspace.sys /move
   (DoubleSpace driver)
```

Compatibility with Windows

Unfortunately, *Falcon 3.0* will not run under Windows 3.0 or Windows 3.1.

Although we do not recommend running *Falcon 3.0* under Windows 95, it can be done if you run the game in MS-DOS mode only and if you can free up enough conventional memory (602K or 616,448 bytes).

MS-DOS mode in Windows 95

To install *Falcon 3.0* under Windows 95, switch to MS-DOS mode:

1. Select "Shut Down…" from the Start menu.

2. Select "Restart the computer in MS-DOS mode?" from the dialog box.

3. You will see the DOS prompt (which will usually look like C:\WINDOWS).

4. Insert the *Falcon 3.0* disc into your CD-ROM drive.

5. Change to your CD-ROM drive by typing **d:** Enter (if your CD-ROM drive is a letter other than D, substitute that letter instead).

6. Type **install** Enter to start the *Falcon 3.0* installer and follow the instructions under "How to install."

Windows 95 boot disk

The biggest problem in getting *Falcon 3.0* to run under Windows 95 is freeing up enough conventional memory (602K or 616,448 bytes). The easiest way to free up enough conventional memory under Windows 95 is to use a boot disk. We have created a utility that creates a boot disk specifically for Windows 95, available online at our Customer Support BBS, America Online, GEnie, CompuServe, FTP site and other locations. Look for the file named FAL95.EXE. Download the file and follow the instructions in the Readme file to create a Windows 95 boot disk for *Falcon 3.0.*

You can also create your own Windows 95 boot disk for *Falcon 3.0* by following the instructions below:

1. Insert a blank disk into your floppy drive.

2. Double-click the icon for "My Computer."

3. Right-click on the icon for your floppy drive, usually "3½" Floppy (A:)."

4. Select "Format…" from the pop-down menu.

5. In the Format dialog box, select "Full" for "Format type" and click to put a checkmark next to "Copy system files" under "Other options."

6. Click on the Start button.

7. After the floppy disk has been formatted, click on the Close button to exit the Format dialog box.

8. From the Start menu, select Notepad from the Accessories program group.

9. Type the following:
    ```
    prompt $p$g
    path c:\windows;c:\windows\command;c:\dos
    loadhigh mouse
    c:
    ```

10. Select "Save" from the File menu.

11. Click twice on the icon that moves up one level. (The icon looks like a folder with an up arrow.)

12. Double-click the icon for your floppy drive, usually "3½" Floppy (A:)."

13. Click in the box next to "File name:" and type **autoexec.bat**.

14. Click the Save button.

15. Select "New" from the File menu.

16. Type the following:
    ```
    device=c:\windows\himem.sys
    device=c:\windows\emm386.exe 2048 ram
    dos=high,umb
    buffers=30
    files=30
    stacks=0,0
    ```

17. Select "Save" from the File menu.

18. Click in the box next to "File name:" and type **config.sys**.

19. Click the Save button.

20. Close the Notepad accessory program.

21. In order to use your mouse in *Falcon 3.0,* you must copy a mouse driver onto this boot disk. The mouse driver is usually named something like MOUSE.COM or MOUSE.EXE and is usually located in a directory called \MOUSE.

22. From the Start menu, select Windows Explorer.

23. Right-click on the icon for your hard drive (usually C:).

24. Select "Find…" from the pop-down menu.

25. In box for "Named:" type **mouse**.

26. Look for a file called MOUSE.EXE or MOUSE.COM in the list of found files.

27. To copy the mouse driver to your boot disk, drag the icon for MOUSE.EXE or MOUSE.COM to the floppy drive icon, which is usually "3½" Floppy (A:)" and is located in the window for "My Computer."

28. To use the boot disk, insert it into your floppy drive and select "Shut Down…" Choose "Restart your computer?" in the next dialog box. After your computer reboots, you should now have enough free conventional memory to install and run *Falcon 3.0.* Use this boot disk each time you want to play *Falcon 3.0.*

EMS (expanded memory)

Falcon 3.0 takes advantage of EMS if you have at least 1MB of EMS. EMS can be used in different ways: to run the ACMI, to load altitude and object data (for faster access), and to play the digitized radio messages. The latter three options can be turned on and off from the System Setup screen.

To check how much EMS you have, type **mem** [Enter] at the DOS prompt. The number next to "bytes free EMS memory" tells you how much available EMS you have. You will need a memory manager (such as EMM386, QEMM or 386Max) to convert extended memory into expanded memory. See your memory manager's manual for information on how to configure your system for expanded memory.

If your computer has only 1MB RAM total, we recommend using your memory manager to load other device drivers (mouse, network, etc.) into high memory. You will be unable to hear the digitized radio messages or use the ACMI replay. You will be able to play in Communications mode, but unless your network drivers are loaded high, you can't play over a Novell NetWare-compatible network.

If your computer has 2MB RAM total, you can edit your CONFIG.SYS file to have 1MB (1024K) EMS. This will allow you to hear digitized radio messages and place the altitude and object data into expanded memory. If you don't have enough EMS remaining to use the ACMI, you may want to turn off some of the other options.

If your computer has at least 4MB RAM total, you should be able to load all the altitude and object data into expanded memory as well as hear the digitized radio messages. This will also give you enough EMS to use the ACMI. The more available EMS you have, the longer your ACMI replay can be.

Troubleshooting

If *Falcon 3.0* is freezing with a blank screen as soon as you try to run the game, the problem is most likely caused by an error in your *Falcon 3.0* configuration file. The easiest way to fix this problem is to delete the FALCON3.DEF file by typing **del falcon3.def** [Enter] when you're in the \FALCON3 directory. After you load the game, go to the System Setup screen in Configuration and select the correct hardware options.

If *Falcon 3.0* is freezing with a blank screen and you have an Acer motherboard, you need to use ACER.COM, a utility we supply to solve the problem. The utility is located in the \UTILS\ACER directory on your *Falcon 3.0* CD-ROM. See the ACER.TXT file for more information.

If you are having video flickering problems and your video card is based on a Tseng ET4000/w32 chip set, you need to use the supplied replacement files to solve the problem. The files are located in the \UTILS\TSENG directory on your *Falcon 3.0* CD-ROM. See the TSENG.TXT file for more information.

If you want greater control of your joystick, you may want to load TMSTICK.COM. For more information on this joystick utility, please read the TMSTICK.TXT file in the \UTILS\TMSTICK directory on your *Falcon 3.0* CD-ROM.

Compatibility with *Falcon 3.0* add-ons

Unfortunately, because the Classic version of *Falcon 3.0* is the latest version, it is not compatible with any of the add-on programs: *Operation: Fighting Tiger, MiG-29* or *Hornet: Naval Strike Fighter.* You cannot install any of these add-on programs to this version of *Falcon 3.0.*

WAR ROOM

Before reading this section of the manual, be sure you have installed Falcon 3.0 *and loaded the program. Complete instructions for installation and loading can be found in* **Section III: Installation and Loading**.

War Room introduction

After you have loaded *Falcon 3.0* and progressed through the intro screens, you arrive at the War Room. The War Room is the main menu for *Falcon 3.0.* Here, you can enter any of the other major areas of the program: Instant Action, Configuration, ACMI or Communications. In addition, you can remove or create a squadron and place that squadron in the Red Flag training area or into a full-blown campaign.

Whenever you exit from any section of the game (Campaign, Red Flag, Instant Action, etc.), you will return to this screen.

War Room operations

The War Room is arranged into three major sections: the World Map, the Squadron area and the TV Monitors. When the red light next to a particular section is illuminated, you can select that section. If the light is not lit, you may need to do something else first before you can enter the area.

World Map

The World Map displays information about your current squadron and theater. It also shows the geographical area where your campaign is located. If you have a squadron selected and that squadron is assigned to a theater, the world map will display a small box on the map which shows where that theater can be found.

Squadron

The lower right-hand corner of the screen is where you select, delete or create a squadron for use in a campaign or the Red Flag training grounds. Before you can start a campaign or enter Red Flag, you need to choose or create a squadron.

Squadrons are the basic unit in *Falcon 3.0*. Although you as an individual pilot fly a single F-16, the rest of the aircraft on your flight are flown by other (computer-controlled) pilots. Squadrons are the equivalent of "saved games" in *Falcon 3.0*. You can have up to six squadrons active at any given time.

Each of the squadron options is located in the lower-right hand corner of the War Room.

FORM button

Select the FORM button when you want to create a new squadron from scratch. Before the first time you form a squadron, the information on the World Map will indicate that you have no squadron or theater selected. When you select the FORM button, you can then choose your squadron's patch using the the arrows in the SQUAD monitor.

This button will be lit if there are fewer than six squadrons already created.

SQUAD (Squadron) monitor

After selecting the FORM button, up and down arrows will appear in this monitor. To choose an insignia, select the green arrows to scroll through your choices. Each insignia comes with its own squadron name attached. When you find an insignia you like, click on the insignia itself to select it. If you are using the keyboard, move your cursor to the left of the arrows and then press [Enter]. You will know that you've selected the insignia if the arrows to the right of the monitor disappear. You are now ready to choose a theater or enter the Red Flag training area.

The SQUAD button will be lit if you have previously created a squadron. You can cycle through this monitor to view the available squadrons until you find the one you want.

DEACTIVATE button

This button is used to remove a squadron from active duty. When you click this button, the currently displayed squadron insignia (as well all the pilots and their statistics) will be deleted — never to be seen again! If you select this button, you will be asked if you want to continue with the operation.

This button will be lit if there is a squadron already selected from the SQUAD monitor.

WARNING: As mentioned above, this option will delete all *records about the current squadron, including pilots, statistics and the like. Use this option with extreme caution.*

THEATER button

Once you have chosen a squadron to command, you can select a theater for your campaign by using this button. Each time you select the THEATER button, a box will appear on the World Map indicating the geographical area of the current theater. Keep clicking on this button until you have picked the theater you want to fly in.

If you choose a new theater for a squadron already engaged in a campaign, all information about that campaign will be lost and your squadron will restart in the new theater. To make sure that you don't accidentally erase an existing campaign, you will be prompted for confirmation.

This button will be lit if a squadron is already selected from the SQUAD monitor.

COMMIT button

Now that you've chosen a new squadron and a theater, you can start up a campaign by selecting the COMMIT button. This will bring you to the War Update screen (see **Section VIII: Campaign** for more information).

In addition, if you have a previous squadron in an existing campaign, selecting this button will bring you to the exact point you were when you last exited the campaign.

This button will be lit if a squadron and theater are already selected.

Telephone

Selecting the telephone to the left of the SQUAD monitor will bring you to the Squadron Ready Room. Here, you can edit pilot names and faces, view the top pilots in your squadron, or transfer pilots to another squadron. Complete details on this room can be found in the next section, **Section V: Squadron Ready Room**.

This button will be lit if a squadron is already selected from the SQUAD monitor.

TV monitors

Selecting each of the TV monitors brings you to a different area in the game.

INSTANT ACTION monitor

Enter Instant Action by selecting the monitor in the upper right-hand corner of the screen. This area of the program is designed to get you in the air to mix it up right away. It is also a useful training tool for learning the various weapons systems and their operations. The Instant Action area is fully explained in **Section II: Instant Action**.

You can choose this monitor at any time. Instant Action is totally independent from your squadrons, so you don't need to choose a squadron before selecting this monitor.

CONFIG (Configuration) monitor

Select the first monitor from the left to access the Configuration area. Here, you can adjust a number of options to customize the game. Some of the things you can customize are the flight control input device, EMS settings, sound options and the difficulty level variables. A number of factors (such as collisions, flight model and enemy logic) comprise each difficulty level, and you have the option to change any or all of them. The Configuration area is described in **Section X: Configuration**.

You can choose this monitor at any time.

ACMI monitor

Access the ACMI area by choosing the second monitor from the left at the bottom of the screen. The Air Combat Maneuvering Instrumentation (ACMI) area allows you to review your missions from two different perspectives after their completion. First, you can view the actions of your plane using a VCR-like interface. You can view how you accomplished an objective from a number of different views. Second, you have the option to see a particular portion of your flight from a tactical perspective. Here, you will see every plane involved in the engagement in a wireframe view from any angle and can follow the course of every missile fired. A description of how ACMI operates can be found in **Section XI: ACMI**.

You can choose this monitor at any time.

COMMS (Communications) monitor

To go to the Communications area, select the third monitor from the left at the bottom of the screen. In the Communications area, two or more players can dogfight head-to-head via network, modem or direct-connect. For an added challenge, you can coordinate on joint missions in a Campaign.

You can only select the Comms monitor after choosing a squadron. If you haven't already selected a pilot, selecting Comms brings you to the Pilot Transfer section of the Squadron Ready Room. If you have selected a pilot, selecting Comms brings up the Communication Setup screen.

RED FLAG monitor

Enter Red Flag by clicking on the fourth monitor from the left. Red Flag is designed both to be a training ground where new pilots learn air-to-air and air-to ground mission skills and a testing area for tactics against a number of opponents and targets. You can choose from a number of preset training missions, or you can design your own mission. All of this takes place in the Nevada desert and is described in the **Section VII: Red Flag**. The training part of Red Flag is described in **Section VI: Air Combat School**.

This button will be lit if there is a squadron already selected from the SQUAD monitor.

Exit to DOS

The monitor in the upper left-hand corner will exit you to DOS. This is the quickest way to end the game from the War Room. If you aren't in this room, you can easily exit to DOS without returning here by pressing Alt X.

Before you begin...

If you want to change how you control your plane (keyboard or joystick), your difficulty characteristics or sound options, you might want to go to the Configuration area before play. In this area, simply make your choices and then select DONE to exit. For more information, see **Section X: Configuration**.

SQUADRON READY ROOM

Squadron Ready Room introduction

The Squadron Ready Room is where you can view all the important information about your currently selected squadron. Choose a squadron and then select the telephone from the War Room to access the Squadron Ready Room. Here, you can view your squadron's best pilots in Sierra Hotel and check out the current statistics for your individual pilots and complete squadron. You can also transfer pilots from one squadron to another and select a pilot to fly using *Falcon 3.0's* Communications mode.

The Squadron Ready Room has four areas: Sierra Hotel, Pilot Information, Squadron Records and Pilot Transfer. To exit the room and return to the War Room, select the telephone on the file cabinet.
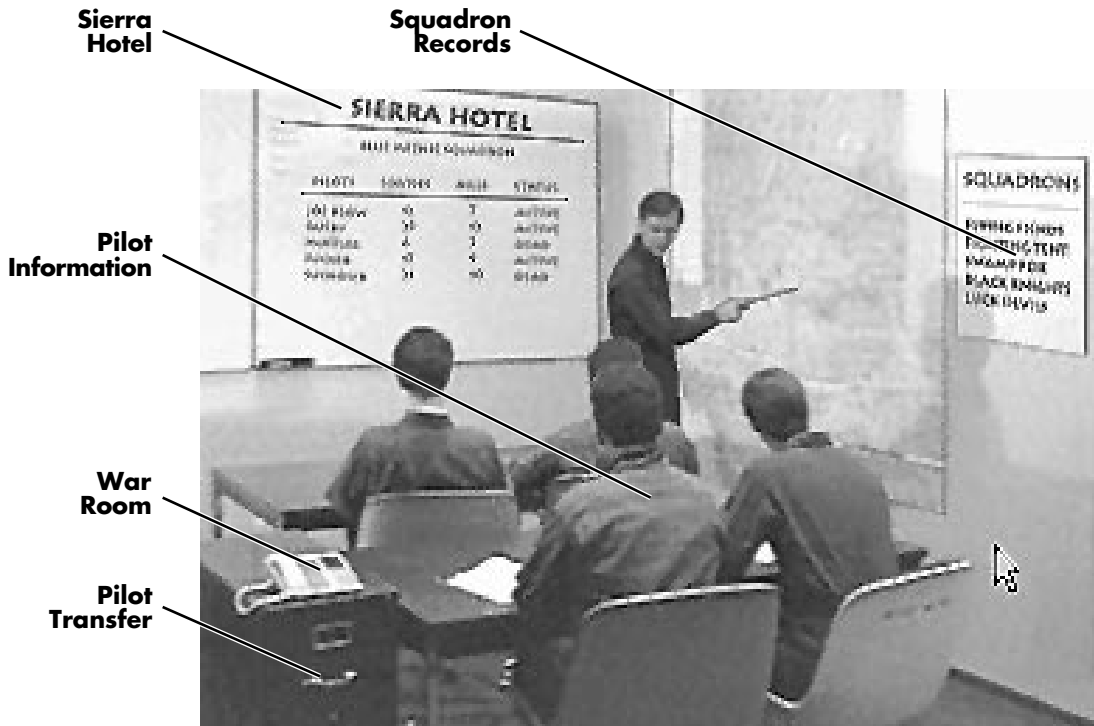
Sierra Hotel

To view the best pilots in your squadron, select the large whiteboard on the upper left side of the room. The Sierra Hotel displays the list of outstanding pilots in your squadron for everyone to admire.

Pilot

This is the name of your ace pilot. Pilots will be listed in order of recognition, from top to bottom.

Sorties

The number of sorties is how many missions your pilot has flown. Each time a pilot goes out on a mission, his sortie total increases.

Kills

This is the number of confirmed kills that pilot has accumulated to date. Confirmed kills include any downed enemy aircraft (fighters, bombers, transports, helicopters, etc.) that have been seen by a witness other than the pilot himself.

Status

A pilot's status can be one of the following: Active (currently in the squadron and ready to fly), MIA (Missing In Action — when a pilot is shot down and falls into enemy hands), KIA (Killed In Action) or Back in x (this is the number of days in the campaign before this pilot can return to active duty).

Pilot Information

To view an individual pilot's performance record, select the lower left-hand pilot next to the file cabinet. The Pilot Information screen will display information about a particular pilot and will also allow you to change his name, face and callsign.

To choose a pilot to view, simply select a name from the monitor in the upper right corner of the screen. Information on the pilot will be displayed below his name, face and callsign.

Pilot abilities

Every pilot has four ability scores, and each of them has a range from 1–100, where 1 is the lowest score and 100 is the highest score. For Dogfighting, Bombing Accuracy and Flying Ability, the first number is the current state of the pilot, while the second number is the maximum ability score for that statistic.

A pilot's ability score can be increased above his maximum by training and successful missions. Ability scores can be temporarily decreased by the amount of Fatigue a pilot is suffering from.

Dogfighting: This skill represents the level of applied BFM (Basic Fighter Maneuvers) and ACM (Air Combat Maneuvers) that a pilot can utilize in a combat environment. This includes overall situational awareness and having an "instinct" of what an enemy aircraft might do next.

Bombing Accuracy: The Bombing Accuracy ability represents the degree of skill a particular pilot has for bombing both moving and stationary targets. In addition, this skill also represents the amount of intelligence the pilot has in recognizing enemy from allied targets and the precise point to release a bomb so that it will cause the most structural damage on a building, bridge, etc.

Flying Ability: Flying Ability differs from the Dogfighting skill because the former is represented by non-dogfight flying accuracy only. Avoiding radar and SAMs, flying at high speeds at low altitudes, flying close over rolling landscape, etc. fall under the Flying Ability rating. A pilot with high Flying Ability will understand the proper way to fly into a target area just under the radar or fool radar using radar-avoidance tactics.

Fatigue: The Fatigue skill represents the amount of physical and emotional stress/endurance a pilot can endure. The lower the Fatigue ability, the less effective he or she will be in performing his combat duties. Degradation of the Fatigue ability is based directly on how many sorties an individual pilot has flown. Each time a pilot flies on a mission, his or her Fatigue skill goes down. However, if a pilot sits out a possible mission, he or she will regain Fatigue points due to rest.

When the Fatigue skill decreases, the other skills decrease as well. This simulates how repeated exposure to combat is draining on a pilot's faculties.

Number of sorties flown

This is the number of sorties (missions) flown by that pilot.

Enemy aircraft shot down

This number indicates how many confirmed kills that pilot has accumulated. Every aircraft in the game has been categorized according to capability and role.

Class A Fighters: Fighter aircraft that are equal or above equal to an F-16 in capability. Examples: Su-27, MiG-29 and Mirage F1.

Class B Fighters: Fighter aircraft that are below an F-16 in capability. Examples: MiG-21, MiG-23 and Mirage III.

Striker/Bombers: Strike aircraft or pure bombers. Examples: Tu-22 and Su-24.

Close Air/Attack Aircraft: Close Air Support (CAS) or Fighter/Attack aircraft. Examples: Su-25 and Tornado.

Helicopters: Military attack or reconnaissance helicopters. Examples: Mi-24 and SA 342.

Transports/AWACS: Transport/cargo aircraft or AWACS search aircraft. Examples: IL-76 and AN-12.

Ground targets destroyed

This is the number of ground targets that pilot has destroyed. The four categories indicates the degree of difficulty it takes to destroy that target.

Class A Target: A target that requires pinpoint bombing or that may shoot back. Examples: bunkers and SAM sites.

Class B Target: A hard target that requires a heavy bomb load to destroy. Examples: runways and bridges.

Class C Target: A target that requires a medium-sized bomb or missile to destroy. Examples: medium-sized buildings and tanks.

Class D Target: A soft target that can be destroyed with a cluster bomb or small iron bombs. Examples: infantry, jeeps and trucks.

Button selections

Pilot roster: To view the statistics of a particular pilot, highlight the pilot's name on the video monitor.

Name: Use this button to change the name of the currently selected pilot. A name can be up to 12 letters long.

Callsign: Use this button to change the callsign of the current pilot. A callsign can be up to 15 letters long. Any radio messages you receive from this pilot in combat will use the callsign rather than the name.

Change Face: Use this button to cycle through the available faces for the current pilot.

Awards: This button will change the left side of the screen to display any awards the pilot has received. Awards are given to deserving pilots who have excelled in combat. To redisplay the pilot information, select the Information button (which replaced the Awards button in the menu).

Done: Select this button when you are ready to return to the Squadron Ready Room.

Squadron Records

To look at your squadron's statistics, select the small whiteboard on the upper right side of the room. The Squadron Records board contains most of the same information as the Pilot Information screen, but on a a squadron level.

The left-hand side of the screen displays the squadron's insignia, name and Squadron Commander. Just below these are the combined records of all the pilots in that squadron.

Number of missions flown

This is the number of missions run by that squadron. It will include all theaters the squadron has ever taken part in. This number, however, will never exceed the sortie count. One mission may have more than one aircraft flying; each aircraft is counted towards the sortie count. For example, if a mission has eight aircraft on it, there will be eight sorties on that one mission.

Number of sorties flown

This is the combined number of sorties flown by all the pilots in that squadron.

Enemy aircraft shot down

This number totals all the enemy aircraft downed by the pilots in that squadron. Each of the enemy aircraft categories is described in the Pilot Information section.

Ground targets destroyed

This number totals all the ground targets destroyed by the pilots in that squadron. Each of the ground target categories is described in the Pilot Information section.

Number of pilots active

When a squadron is formed, you will have 30 pilots on your roster. You may lose some due to casualties or fatigue. You can regain pilots when replacements arrive in a campaign. This number indicates how many are ready for active duty.

Number of pilots killed

This indicates the number of pilots killed in action (KIA), whether by enemy gunfire or pilot error.

Number of pilots MIA

This indicates the number of pilots missing in action (MIA). A pilot becomes MIA after ejecting behind enemy lines and not being rescued.

Pilot Transfer

To transfer a pilot from one squadron to another or to select him for Communications mode, select the file cabinet. This brings you to the Pilot Transfer screen.

The left-hand side of this screen displays one of the other squadrons in the game, while the monitor on the right-hand side displays the pilots in your squadron. To transfer a pilot from your squadron to the other squadron, first select a name from the monitor on the right. Then select a name from the list on the left-hand side. The two names will then change places.

Pilot roster: The pilots in the monitor on the right-hand side are the pilots in *your* squadron.

Squadron: This button will change the squadron on the left-hand side to another of the squadrons in the game. If you haven't created any other squadrons, this button will be grayed out.

Pilot Information: You need to select a pilot from your squadron before choosing this button. Selecting this button will bring you to the Pilot Information screen described earlier. The only difference is that when you select Done from that screen, you will return to the Pilot Transfer screen.

Comms.: Before selecting this button, you need to choose a pilot from your roster. This is the pilot you will bringing into the communications part of *Falcon 3.0.* After you select this button, you will be transferred to the Communications Setup screen to set up your communications session. See **Section XII: Communications** for more details on communications.

Done: This button will return you to the Squadron Ready Room.

War Room

Select the phone on the file cabinet to return to the War Room.

AIR COMBAT SCHOOL

Air Combat School introduction

Welcome to Air Combat School. Here, you'll learn everything you ever wanted to know about your F-16 Fighting Falcon. Each lesson is designed to teach you one or two key aspects of flying or fighting. Once you've finished your training, you'll have the knowledge and experience to mix it up with the best of them. Even if you already know how to fly, these lessons will teach you important specifics to survive in a combat environment.

There are a couple of things to remember before we begin:

1. Work through the lessons by the numbers.

Each lesson has been planned to take advantage of items learned in previous lessons. This way, you can build on your knowledge without getting confused or lost. When learning a lesson, keep working on it until you are successful and then proceed to the next lesson.

2. Always fly these lessons in Intermediate skill level.

To change your skill level to Intermediate, you'll need to go to the Configuration area. This will ensure that your F-16's instrumentation will operate as described in the lessons.

1. From the War Room, select the first monitor on the left at the bottom of the screen.

2. When the Difficulty Levels screen appears, choose "Intermediate" from the Skill Level heading on the left-hand side of the screen.

3. When that light illuminates, choose "Done" from the upper right corner of the screen.

For more information on the Configuration area, see **Section X: Configuration**.

Loading the training lessons

The training lessons are a part of the Red Flag area. To load a mission:

1. From the War Room, choose a squadron to fly from the monitor in the lower right-hand corner of the screen. For more information on selecting a squadron, see **Section IV: War Room**.

2. Now select the first monitor to the left of the phone to enter Red Flag.

3. On the next screen, choose your training lesson by scrolling the window in the upper right-hand corner of the screen. Once you've highlighted the name of the mission you want to run (e.g., LESSON1, LESSON2, etc.), select the Load Mission button. Then, select the F-16 Pilots button.

4. Hit the ⟨Enter⟩ key to continue past the F-16 Pilots screen. This will bring you to the F-16 Armament screen.

5. Now, read the lesson description in the manual. When you are ready to try the lesson, select the Takeoff button. This will place you in the cockpit of your F-16.

6. After the mission is over, select the Red Flag Control button from the Debriefing screen to bring you back to the Red Flag Control screen.

Training lesson breakdown

Here are descriptions of the various missions in this section:

Lesson 1: Takeoff and Flight. This lesson teaches you how to take off and the basics of flying your F-16.

Lesson 2: Head-Up Display and G Forces. Here, you learn the basic features of the Head-Up Display (HUD). You'll also learn about positive and negative G forces.

Lesson 3: View Manipulation. All the outside and inside views (except Padlock View) are described and taught here.

Lesson 4: Landing. This covers how to land using the Instrument Landing System (ILS), its corresponding HUD mode and the Angle of Attack (AOA) System.

Review 1: Takeoff–Landing. This review covers the first four lessons, from takeoff to landing.

Lesson 5: Weapons Selection and Situation Awareness Mode (SAM) Radar. This lesson teaches the basics of weapon selection and firing as well as a basic knowledge of the Radar/Electro-Optical (REO) display.

Lesson 6: Air-to-Air Weapons Delivery. This lesson instructs you on how to read your air-to-air HUD modes and how to fire your weapons effectively.

Lesson 7: Air-to-Ground Weapons Delivery. Similar to Lesson 6, this lesson teaches how to use all the air-to-ground weapons by describing the A-G HUD modes.

Lesson 8: Padlock View. This is an entire lesson on how to use the 360° Padlock View. You will learn how to read all the displays to gain a superior position on your enemy.

Review 2: A-A/A-G Engagement. This complete mission covers all of Lessons 1–8: takeoff, air-to-air dogfight against a variety of enemy aircraft, air-to-ground destruction of a nuclear power plant and landing at your home airfield.

General briefing

So, you want to learn how to fly? Everything you need to know comes from me. The name's Mike Barstow, and I'm your instructor for these sessions. You can call me Mike or by my handle, "Threepoint." I'll explain that one later. Listen to me, and you'll do fine. Don't listen and your bird may get foxtrot uniform in the sky, if you know what I mean.

There are a couple of things you need to know before you grab the stick and go hog wild. First of all, be gentle with the plane. She doesn't require much prodding to do what you want, so there's no need to go slamming your stick back and forth when making a turn. Ease into it. Second and most important is listen carefully to what I say. Hey, it may sound obvious, but the easiest way to learn is through me. I'm not going to steer you wrong, so you don't have to worry.

Anyway, enough of all that. Got your equipment ready? Helmet? Skull cap? G suit? Parachute? Ok, let's go.

Overview: Lessons 1–4

These first four lessons are designed with the novice in mind. Even you hotshots out there who don't think you need this stuff should go through these. Why, you ask? Because every jet handles differently, and the F-16A is no exception.

Lessons 1–4 will teach you all the fundamentals of the F-16: how to read the instruments, the head-up display (HUD), controlling your bird's flight, all the different views and (last but not least) the two most important parts of flight, takeoff and landing. After these lessons are finished, you'll be able to do all these things and more.

Lesson 1: Takeoff and Flight

One of the most dangerous activities in today's modern fighter jet is the takeoff. It appears so easy that it lures inexperienced pilots into a false sense of security. Don't let that scare you — if you've got the proper training (like I'm going to give you), takeoffs will be almost automatic. Just let ol' Mike guide you through it. No problems.

This lesson will cover how to use your plane's directional control (the "stick"), throttle and afterburners, autopilot and a couple other features. So go ahead, hit the Takeoff button so we can begin.

Before you begin

The first thing you'll see is the front view out of your cockpit. Don't be overwhelmed by the ton of dials and stuff in front of you. We'll get to it all in due time. The first two things you want to concentrate on are the directional control and the throttle.

The stick

The directional controller in your F-16 is simply called the "stick." You use it for controlling the plane's pitch and roll (up, down, left and right movements). It's the single most important piece of equipment on your plane because without it you can't fly.
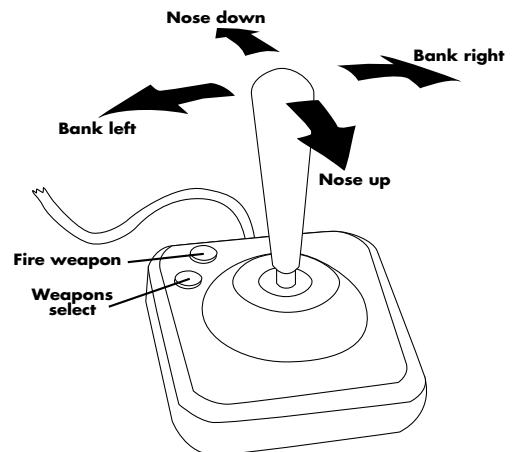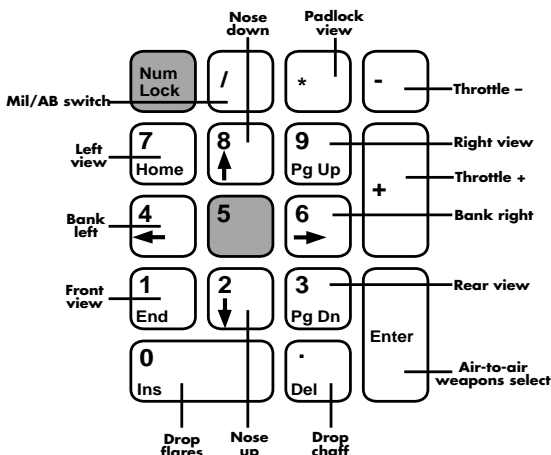
For the sake of simplicity, I'm going to assume you're using a keyboard or a joystick for flying around. If you have a different type of controller (two joysticks or a ThrustMaster), check **Section IX: Flight** for complete flying instructions. The keyboard and joystick controls are fairly simple, and I'll describe them below.

When you get in the air, don't be yanking around on the stick. It doesn't require much effort to turn your bird, so be gentle.

Climbing and diving

Pulling back on the stick makes your plane climb (gain altitude), while pushing the stick forward makes your plane dive (nose toward the ground).

Banking left and right

If you push the stick to the left or right, you begin a gradual turn. To increase the speed of your turn, push the stick to one side or another while pulling back on the stick.

RPM Indicator and throttle control

The first dial you will have to know about is the RPM Indicator. You can find it at the far right of the cockpit. Currently it is at 0, meaning you haven't started the engine yet. You can increase your RPMs by pressing the ⊞ key and decrease them by pressing the ⊟ key. The maximum amount of throttle you should apply without releasing the wheel brakes is about 60% RPM.

In addition to your standard thrust (known as Mil Power), you also have a five-stage afterburner for extra acceleration. To engage the afterburner, press the ⌸ key. (Note the indicator just below the RPM Indicator changes from "MIL" to "AB".) To increase the afterburner stages (and thus increase your speed), press ⌞>⌟. To decrease a stage, press ⌞<⌟. Since the afterburner uses a ton of fuel, you should generally only use it for takeoffs and to outrun the enemy.

Takeoff

Now that you're familiar with the stick and throttle controls, it's time to take off. First, check out the upper middle screen with the green letters and numbers. This is your Head-Up Display, better known as the HUD. The HUD shows you all the necessary information about your F-16 and its weapons. For takeoff, we're only interested in three of the items — the rest will be covered in the next lesson.

The Head-Up Display

Look to the left side of the HUD. This is the Airspeed Scale, and it tells you how fast your aircraft is going. In the middle of the HUD is a series of horizontal bars called the Pitch Ladder. This shows you your current angle of climb (or dive). On the far right side of the HUD is the Altitude Scale which shows you your current altitude in thousands of feet.

Airspeed Scale
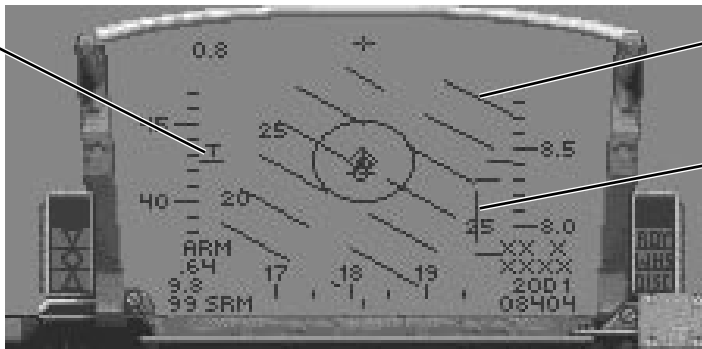
Pitch Ladder

Altitude Scale

Start 'er up

Go ahead and engage the engine by pressing and holding the ⊞ key until the indicator reaches about 60%. Now kick in the afterburners ⃞ and watch the Airspeed Scale. Just after it reaches 15 (150 knots), ease the stick back gently to about 10° on the Pitch Ladder. Don't let your speed go beyond 20 (200 knots), or you'll burn your tires clean off.

Landing gear

Right after you get in the air, be sure to raise your landing gear by pressing the ⃝ key. Flying around with your landing gear up at speeds over 300 knots will cause permanent damage to your aircraft as well as hamper your maneuverability in the air. You can tell that your gear has been raised if the Wheel Status Light goes out on the right side of the cockpit and all lights go out on your AR/NWS (Air Refuel/Nose Wheel Steering System) Light just to the right of the HUD.

Now that you've raised your gear, look at the Pitch Ladder. Keep it at 20°–30° until your Altitude Scale reaches 8.0 (8,000 feet). Now, level off by pushing forward on the stick until the Pitch Ladder is at 0°and then turn off your afterburner by pressing ⃞. Congrats, you're in the air!

Fly around

Now that you're up in the sky, fly around a bit to get used to your plane. Make nice, gentle movements on the stick and keep an eye on your Altitude Scale. If it drops below 2,000 feet, level out and then gain a little more altitude.

Pause key

If you think your plane is going out of control or you accidentally hit some unfamiliar key, you can press ⃠ to pause your aircraft in mid-flight. Now you can stop, take a breather, and figure out where you are or what you just did. When you are ready to continue flying, just press ⃠ again.

Speed brakes and flaps

If you want to temporarily reduce speed without reducing the amount of engine thrust, toggle the speed brakes on or off with the B key. You can use your flaps (F) to help slow you down when landing. However, make sure you don't lower your flaps at speeds over 400 kts, or you'll shear them right off. Keep flying around until you feel comfortable with the controls, and then we'll talk about the autopilot.

Autopilot

The computerized autopilot is used in a number of ways, but is primarily designed to follow your predesigned route in and out of your mission area. It will also follow enemy planes in an attempt to get behind them in a dogfight.

To engage the autopilot, press the A key. You can now watch as the plane will level, fly to a point north of your air base, then return to land. Before the plane returns to your home airfield, press the \ key. This will bring up the HUD for the Instrument Landing System (ILS). Watch the horizontal and vertical bars as they line up in a cross. I'll give you all the details about the ILS HUD in Lesson 4, when I teach you how to land.

Accelerated mode

When you're in autopilot, you can hold down the Tab key to speed up your flight. The accelerated mode will increase actions in the outside world by a factor of 4x. You can also lock accelerated mode by pressing Shift Tab. Don't try accelerated mode unless you're in autopilot, or you'll smack into the ground so fast it'll make your head swim.

On the ground

Once you've landed and your plane has come to a stop, engage the wheel brakes by pressing the W key. You always need to set the wheel brakes when you stop on the runway. Now, press Esc to bring up the menu bar and select End Mission from the FILE menu. You've just completed your first lesson and are well on your way to becoming "ace of the base."

Lesson 1 review:

In this lesson, you learned the following:

- ✦ Stick controls
- ✦ Throttle and afterburner controls
- ✦ Wheel brakes
- ✦ Raising the landing gear
- ✦ Pause key
- ✦ Speed brakes and flaps
- ✦ HUD basics: Airspeed Scale, Pitch Ladder and Altitude Scale
- ✦ Autopilot
- ✦ Accelerated mode
- ✦ Menu bar (End Mission)

Next lesson, you'll learn everything you ever wanted to know about your HUD.

# Lesson 2: The Head-Up Display (HUD)

Your HUD is the most important instrument in your plane (actually, it's a combination of instruments all wrapped up in one) and is essential to flying. It contains vital information relating to your F-16's airspeed, altitude, heading and weapons information. If your HUD gets knocked out in combat, you're up sierra creek without a paddle.

This short lesson will teach you all the basics about your HUD and how to toggle between different HUD modes. We'll talk about specific HUD modes and how to use your weapons in Lessons 5–7.

Before you begin

You're going to start out with your plane on the runway. Don't worry about controlling the plane for now; simply prepare to put your plane in autopilot and then watch the readouts.

Below is a diagram of where everything on the HUD is. You should refer to this whenever necessary when I'm describing this stuff.
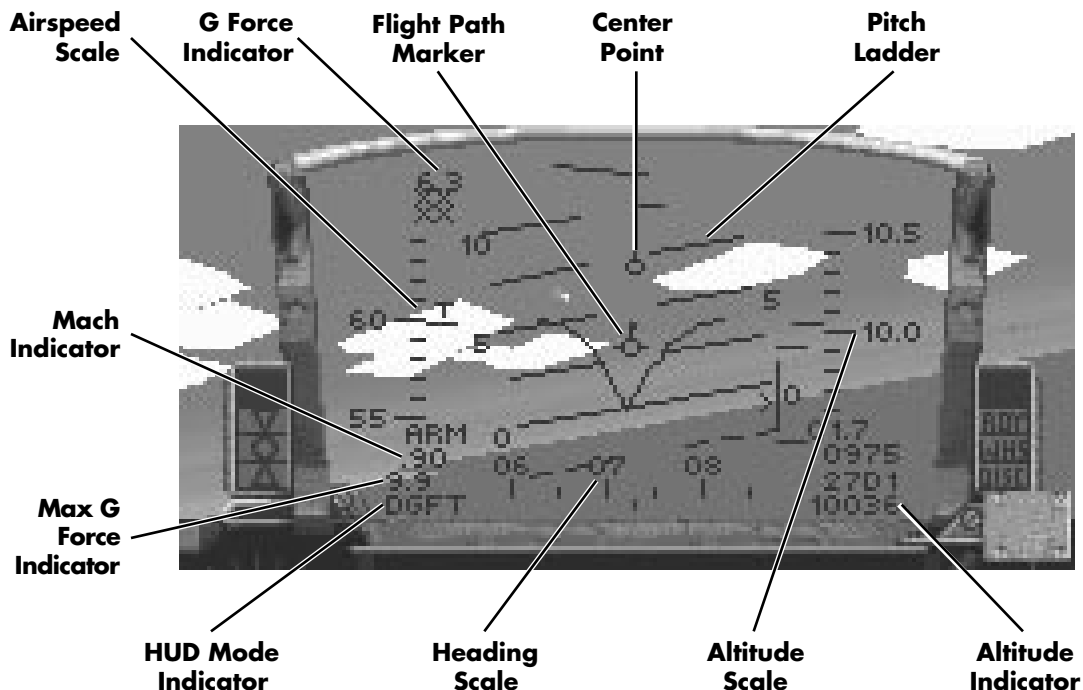
Takeoff

In this lesson, don't bother to take off manually. Instead put the plane in autopilot (Ⓐ) and watch the HUD. You learned about your Airspeed Scale, Pitch Ladder and Altitude Scale in the previous lesson, but let's go over them once again.

Airspeed Scale

Located on the far left-hand side of the HUD, the Airspeed Scale measures your plane's current true airspeed (TAS) in knots. You can read this scale by looking at the hash mark with the "T" above it. True airspeed is adjusted for error based on altitude and air density.

Altitude Scale

The Altitude Scale is located on the far right-hand side of the HUD. It measures your current altitude *above sea level* in thousands of feet. The hash mark in the middle of the scale is where you should read your altitude.

Pitch Ladder

The Pitch Ladder (the horizontal bars in the center of your HUD) shows your current degree of climb or dive. If you are climbing, these bars will be solid. If you are diving, these bars will be dashed.

Major HUD features

In addition to the Airspeed Scale, Altitude Scale and Pitch Ladder, the F-16's HUD has many more features. I won't explain every little feature, because some of them relate only to specific HUD modes. I'll talk about those in later lessons.

Don't worry about memorizing all these instruments at once; just familiarize yourself with them for now.

Heading Scale

This scale shows your F-16's heading. The Heading Scale will be along the bottom of all air-to-air HUD modes and at the top of all air-to-ground HUD modes. In this scale, 0° is north, 90° is east, 180° is south and 270° is west. Read the current heading by looking at the hash mark in the lower middle of the Heading Scale.

You'll also notice a small upside-down "v" moving around the bottom of the scale. That's the Waypoint Caret and shows you the direction of the next "waypoint" on your flight route. When you plan out a mission, each point where you change direction or where you plan to take an action is called a waypoint.

Flight Path Marker

The Flight Path Marker is used to show changes in your flight direction. When you pull back on the stick, the Flight Path Marker will correspondingly move to show you which direction you are heading. If you let go of the stick, the Flight Path Marker will slowly drift back to the center of the HUD.

Center Point

The Center Point is located in the exact middle of most HUD modes and is used with the Flight Path Marker as a reference for which direction your plane's nose is pointing. If you are not moving the stick, the Flight Path Marker will be positioned directly over the Center Point.

HUD Mode Indicator

This display is located as the last line in the lower left-hand corner of the HUD. It's used to show which weapon system (and corresponding HUD mode) is currently selected on your aircraft. We'll discuss this in depth when we talk about specific HUD modes in later lessons.

G Force Indicator

The G Force Indicator (located just above the Airspeed Scale) measures the current amount of Gs your plane is currently pulling. Gs are the amount of gravity acting on you and your plane at any one time. At 9 Gs, blood flows away from your head and you begin to blackout. In addition, if you do -3 Gs (nosing your plane down, for example) too much blood flows to your head and you will begin to redout. Basically, if you start to blackout or redout, ease off the stick until your vision comes back in focus.

Max G Force Indicator

You can find this display in the lower left-hand corner of the HUD, just above the Weapon Indicator (the second line from the bottom). This shows the maximum amount of Gs you have pulled since you stepped into the aircraft.

Mach Indicator

This display (the third line from the bottom in the lower left-hand corner) shows your airspeed as a percentage of the speed of sound. The speed of sound is Mach 1.0.

Altitude Indicator

The bottom number in the lower right-hand corner of the HUD displays your current altitude *above ground level* (AGL). This differs from the Altitude Scale, because the Altitude Indicator shows altitude above your current terrain, while the Altitude Scale shows altitude *above sea level.*

Cruising around

When the plane levels off at 14,000 feet, take your plane off autopilot (with the Ⓐ key). Kick in your afterburners (⃞/) and increase the staging (hit the ⃞> key twice) so that the display below the RPM Indicator reads "AB3." This is a good time for your first lesson in G forces.

Positive and negative Gs

I hate negative Gs. All pilots hate negative Gs. You will learn to hate negative Gs. Negative Gs are the most uncomfortable thing a pilot can experience because you feel like your stomach is flying up through your mouth. Also, the pressure on your head feels like an 800-pound gorilla is giving you a headlock. Let's go ahead and push some negative Gs, so you can see what it feels like and not do it again, ok?

Right now, you're probably flying at about 630 knots (kts). Now push the nose down. See that! You start to redout almost immediately. This is G Force Lesson Number One: avoid negative Gs whenever possible. Let's try this experiment again, but this time we'll pull positive Gs to execute the same maneuver.

Level the plane out (either manually or by autopilot until the plane levels). Once level, turn off your autopilot if you had it engaged. Now, we'll execute the same dive, but pulling positive Gs instead of negative. Bank your plane to the left until the plane turns upside-down and then pull back on the stick. Dive down for a while and then bank to the right and pull back on the stick until you level out. See how much easier that was? Not to mention that you

are able to make the same maneuver in a shorter time. Your plane is three times more maneuverable in positive Gs than it is in negative Gs.

Landing

Ok, now that you've had your G force lesson, it's time to land. Just like you did in Lesson 1, turn on the ILS HUD mode (the ⧵ key) and then engage the autopilot. After landing, turn on your wheel brakes (W). Now, go to the menu bar (Esc) and select End Mission from the FILE menu.

Lesson 2 review:

In this lesson, you learned about the following items on the HUD:

- ♣ Heading Scale and Waypoint Caret
- ♣ HUD Mode Indicator
- ♣ G Force Indicator
- ♣ Max G Force Indicator
- ♣ Mach Indicator
- ♣ Altitude Indicator

In addition you learned the basics of G forces:

- ♣ Redout
- ♣ Blackout
- ♣ Positive and negative Gs

Next lesson, you'll learn about all the different inside and outside views. I'll also explain the best and worst times to use each of these views. Anyway, on to the next lesson.

Lesson 3: View Manipulation

Ok, you can look at your F-16 in a number of different ways. Some of them take the perspective from inside the cockpit, while some look at your plane from the outside. You can even watch the path of your missile or look at a missile from your target's point of view.

In this lesson I'm going to teach you when to use certain views to your best advantage in both combat and non-combat situations. And, yes, there are times that you absolutely shouldn't use a particular view. I'll talk about those as well.

In the plane

Here you are, back in your plane on the runway. Before you take off, let's take a look through your inside views and I'll tell you what you are seeing.

Front View

This is the old, familiar view from the last two lessons. It's the most useful of the views because it contains a number of vital instruments including the HUD, Radar and Threat Warning Indicator. Press ③ (or ① on the numeric keypad) to look out the Front View.

Left View

Press the ④ key (or ⑦ on the numeric keypad) to look out the left side of your cockpit. The Left View gives you access to a number of instruments, including the Fuel Indicator, Landing Gear Lights, AVTR Status Light and Tape Indicator, IFF Light, Backup Airspeed Indicator and the Compass. This view is useful for checking out these instruments, but isn't very good in combat situations.

Right View

Press the 6 key (or 9 on the numeric keypad) to look out the right side of your cockpit. Here you'll see a clock displaying the current mission time and your Caution Light Panel. The caution lights are used to indicate damage to your plane. If you hear a frantic high-pitched tone or a warning voice, you better look here to find out what's wrong. As with the Left View, this view isn't good in combat.

Rear View
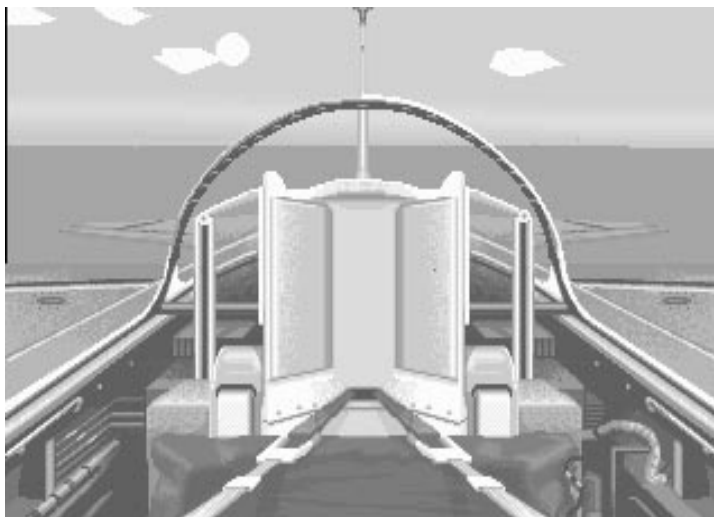
This doesn't show you any instruments, but it's useful to look out for enemy planes that might be sneaking up on you. You can also use it for checking up on your wingmen. Press 5 (or 3 on the numeric keypad) to look behind you.

Up View

This simulates you looking straight up from your chair. It's somewhat useful if you are inverted or when you're in air combat and observing an enemy plane. Press the [U] key to look up.

Cockpit scrolling

If you press the [Scroll Lock] key when using any of the inside views (except the Up View), you will look either up or down in that cockpit view. Change to the Front View (the [3] key) and press the [Scroll Lock] key. See how it works? Each of the inside views has independent scrolling, so you can choose to look up or down. This scrolling feature makes the inside views more useful for air combat.

Outside views

Most of the outside views are fun to fly in but are extremely poor for combat. If it's a combat situation, switch back to Front View, Track View or Padlock View. I'll explain Padlock View in Lesson 8.

Just to let you know, all the outside view keys can be found on the top row of the keyboard.

Track View

The first major outside view is Track View. Right now you'll see a fixed view from a camera directly behind your aircraft. If your plane rolls, the camera will roll with you. When you get in combat, you'll see your plane and any plane you've locked onto (including your wingman). This makes it really easy to track an opponent. Switch to this view now by pressing the [9] key.

View Status Box

The first thing you'll notice about any one of the outside views is that box at the bottom of the screen. This is the View Status Box, and it shows you current info about your view. Everything's pretty self-explanatory except the "Zoom" Indicator. Let's go over this now.

Zoom keys

When you're in an outside view, you can zoom in and out on your bird to see it from closer or farther away. Press [F1] to zoom in and [F2] to zoom out. Notice that when you press these keys, the Zoom Indicator will increase or decrease. The max zoom level is 15 and the minimum is 1. Go ahead and set it up for zoom level 5.

Rotate keys

In any of the outside views, you can rotate around your plane horizontally or vertically. Rotate clockwise by pressing and holding the [F3] key. If you want to go back the other way (counterclockwise), hold the [F4] key down.

To circle your plane vertically, press and hold the [Shift] and [F3] keys down together. If you want to rotate the other direction, hold down the [Shift] and [F4] keys together.

Finally, if you want a finer rotation on your views, hold down the [Ctrl] key with any of the above combinations.

If you got lost or if you're looking at your plane at a really weird angle, hit the [3] key to get back to the Front View. Then select whichever outside view you want.

Takeoff

Well, after all that you're ready to take off. From the Track View, pan around your aircraft, so you are looking at its side. Now, go ahead and use your autopilot (Ⓐ) for takeoff. This way, you get a great view of your bird as it streaks off the runway.

Once the plane levels off (at about 10,000 feet), take your plane off autopilot (Ⓐ) and we'll start up on some of the other outside views.

Satellite and Ground Views

These two views are almost identical. The Satellite View (①) looks at your plane from directly overhead, while the Ground View (②) checks out your plane from directly below. You can also use the Rotate and Zoom keys on these views to see your plane from various angles. By the way, in case you didn't figure it out already, these two views are really lousy in combat.

Wingman View

In case you haven't noticed, you've got a wingman on this flight. If you go to the Track View, you can pan around and see him. (He'll probably be right behind you.) If you want to take a look at things from his perspective, hit the ⑦ key. Now you can rotate around him and watch your own plane.

Rotate around in this view until you are looking at your own plane. Now, roll out and watch what happens. Your wingie will lag behind a bit, then follow your plane. Hit Ⓐ to go back to autopilot.

The best time to use Wingman View is just before a combat situation when you are sending him out to execute a particular maneuver.

Chase View

(By the way, this is one of my faves.) Hitting the ⓪ (zero) key brings up the Chase View. This gives you the angle from directly behind your plane like in Track View, but watch what happens if you nose your bird down.

Take your plane off autopilot (Ⓐ) and then go ahead and push down on the stick. There will be a slight lag, then the view will follow your plane. Fly around a bit and watch the results. This is a great view when flying around, but just like most of the outside views, it's really crummy to dogfight in.

Missile, Enemy and Target Views

These three views are used only when you're shooting at someone or something. The Ⓠ key toggles between these views, and you can use the Rotate and Zoom keys on these views.

The Missile View follows the path of a fired missile, while the Enemy View shows you the point of view from a targeted enemy plane or ground target. The Target View is behind air-to-air targets; see **Section IX: Flight** for more details on all these views.

Padlock View

This view will be covered in depth in Lesson 8, but I'll go into it briefly here. Basically, what you've got is a 360° inside-the-cockpit view. Here, you can padlock (keep your eyes fixed) on your enemy at all times. As an enemy plane shoots past your F-16, your eyes will never leave that plane. With this view, you have a much better chance of defeating your enemy. You can hit ⑧ (or ✳ on the numeric keypad) to see the Padlock View. There won't be anything there right now except your wingman, but you can see how it works.

Landing

Ok, now go back to the Track View (⑨) and hit Ⓐ to have your bird finish its route and land. Set your wheel brakes and then go ahead and select End Mission like you did in the previous two lessons.

Lesson 3 review:

In this lesson, you learned about the following inside views:

- ✦ Front View   ✦ Left View
- ✦ Right View   ✦ Rear View
- ✦ Up View   ✦ Cockpit scrolling

You also learned about outside views:

- ✦ View Status Box   ✦ Track View
- ✦ Satellite and Ground Views   ✦ Wingman View
- ✦ Chase View   ✦ Missile, Enemy and Target Views

Finally, you learned how to manipulate your outside views:

- ✦ Rotate keys   ✦ Zoom keys

In the last lesson of this section, you will finally learn how to land. You've seen it on autopilot, now live the adventure!

Lesson 4: Landing

And you thought taking off was hard! A bad takeoff can end your trip real early, but you never live down the embarrassment of a crash landing. Don't worry, though: by the time you run through this lesson a few times, you'll be landing in your sleep.

This lesson will cover the "racetrack" method of landing — the ILS HUD mode, the angle of attack (AOA) system, using the rudder and abort procedures.

Before you begin

In order to land using your Instrument Landing System (ILS), you need to approach a runway that broadcasts ILS signals. At Nellis, there is only one air base that is set up to broadcast ILS signals, but each campaign theater may have multiple air bases equipped with this system.

This is the first lesson that you're going to start out in the air. Don't worry, you've got a little "play" time before you have to worry about landing. Your plane is going to start due north of the runway at 8,000 feet, about nine or so miles out. Keep your hands off the controls for now, so I can explain a few things first.

The two main instruments designed to help you land are the ILS HUD mode and the AOA System. Both systems help you line up for that perfect approach angle.

Instrument Landing System (ILS) HUD mode

First thing you want to do before approaching your home airstrip is engage the ILS HUD mode. Do so now by pressing the ⌐\ key; then press the P key to pause. Now the circle in your HUD will be replaced by notched horizontal and vertical bars, the Glide Slope Deviation (GSD) Bar and the Localizer Deviation (LD) Bar. Your goal when landing is to align these bars so that they form a perfect cross.
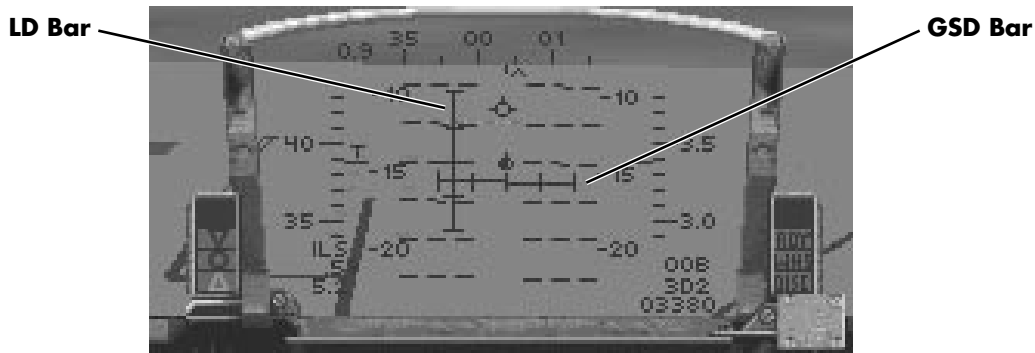
LD Bar

The LD Bar measures your offset from the center of the runway. You want to align the vertical bar so that its center is in the middle of the HUD. If the LD Bar is to the right of center, you need to bank right. If it's to the left of center, you need to bank left.

GSD Bar

The GSD Bar measures your vertical angle to the runway. When the middle of the LD Bar is in the center of the HUD, you're approaching the runway at a proper angle. If the GSD Bar is above the center of the HUD, you are coming in too low. On the other hand, if it's below the center point, you're not low enough.

Angle of Attack (AOA) System

The AOA System consists of two indicators: the AOA Indexer and the AOA Indicator. Both indicators are used to display your aircraft's angle of attack. The main difference between the two is that the AOA Indexer shows it with a series of lights while the AOA Indicator uses a numerical scale.

AOA Indexer

The AOA Indexer is located just to the left of the HUD and basically illuminates one of three lights. These lights won't come on until you engage the ILS HUD mode. A perfect angle of attack and landing approach is when the center circle is lit.

If the top caret is on, it means that your AOA is too high because your airspeed is too low. To correct this, increase your airspeed by adding power or nosing your bird down to a proper angle.

If the bottom caret is on, it means that your AOA is too low because your airspeed is too high. You should nose your plane up a little or use your speed brakes or flaps to bleed off airspeed until the center AOA light comes on.

AOA Indicator

The AOA Indicator is located just to the right of the REO Display and immediately below the RPM Indicator. You can use this to judge your AOA for landing or when you are in combat. This indicator works in conjunction with the AOA Indexer to assist you in landing.

This indicator color-codes your AOA — light blue if you have a positive AOA, red if you have a negative AOA. A perfect AOA for landing is between positive 10°–13°. If your AOA is above 13°, the top caret on the AOA Indexer will light up. If your AOA is below 10°, the bottom caret on the AOA Indexer will turn on.

Using all these things

You're probably saying to yourself, "Great, Mike, you've told us how these things work, but how do they **work**?" Don't worry, I'm getting to that.

Before you unpause the game to release your plane, make sure that you understand the concepts I explained above. If you read it again and still don't get it, you can either take a look at the landing portion of **Section IX: Flight** or follow along with my walk-through. Perhaps at the end of the lesson, you will get a better grasp of what I'm saying.
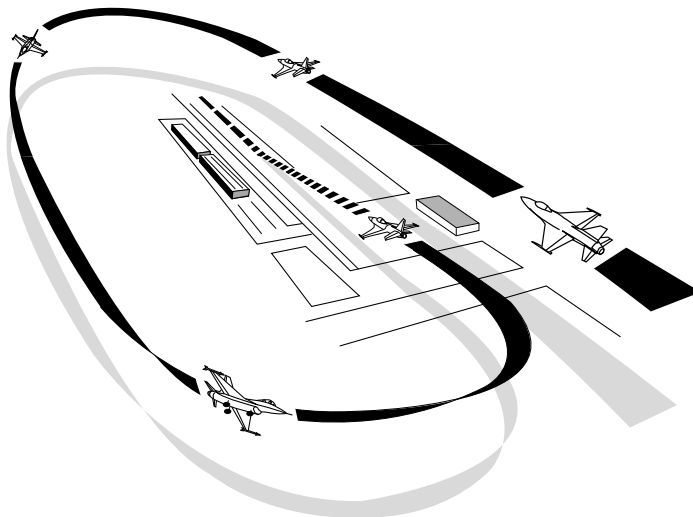
Heading

First, you need to be facing your runway. It's important to note that your ILS HUD mode won't tell you if you are facing the wrong direction, so you need to know the direction of your runway. (For example, you could have the GSD and LD Scales lined up with perfect AOA, but you might be flying perpendicular to your runway.)

Take your aircraft off pause by pressing the P key and start to line up your bird with the approaching runway. In this lesson, you start out eight miles due north of the airfield, with a heading of due south. You can find out how far away you are from the runway by looking at the lower right-hand corner of the HUD. The Waypoint Indicator will show the number

of miles to the next waypoint (which is your airfield) followed by the letter "D" and then a "2" representing the waypoint number. Also, take a look at the Waypoint Caret on the Heading Scale to help you align yourself to your airstrip.

Your landing approach heading should be somewhere around 180°. (Check the Heading Scale to see if that's true.) Don't worry about your AOA for now; just make sure you're facing that runway.

First runway approach

As you approach the airstrip, keep a close eye on the Waypoint Caret to make sure that you're heading the right direction. You'll also want to reduce your speed to about 400 kts and begin to descend at a rate of 1,000 feet/mile. Play around with the angle of descent until you feel comfortable with it, but it should be somewhere around -7°.

One key thing to remember is that most runways are aligned to the compass points: 0°, 90°, 180° and 270°. When you get within visual range of the end of a runway, you can see a number at the beginning of that runway. That's the angle you need to be heading for a straight approach (either 0, 9, 18 or 27 for the above four compass points).

Five miles to base

When you reach the five mile marker, you should be at about 5,000 feet. Now, you want to drop your airspeed to about 350 kts for your initial approach. Keep descending at 1,000 feet/mile until you reach about 2,000 feet.

Two miles to base

At the two mile marker, you should be somewhere around 2,000 feet altitude. It doesn't matter if you're a little high or low; just be sure to keep it at about 2,000 feet. You should get a visual sighting of the runway about now, so you're going to want to descend and line up parallel with the runway you want to land on.

Parallel the runway

Once you're lined up with the runway, you should be at about 400 feet or so above it. Keep this altitude as you fly over the runway. When you're past the runway, you want to start making a gentle 180° left turn and keep turning until you're flying back the way you came. You'll want to keep your airspeed at around 250 knots when you're making your turn.

Return approach

On this downward leg, you'll want to remain about 300–400 feet and about 250 knots. Now's the time to drop your landing gear ([G]). You'll notice that the top and bottom lights of your AR/NWS Status Indicator have lit up and your Wheel Status Light has turned on. Since dropping the gear causes drag on your aircraft, increase throttle to keep your airspeed at about 250 kts.

Go ahead and check your Left View to see where the airstrip is. You should remain parallel to your runway at all times. Switch back to the Front View when you've aligned with the runway.

Second runway approach

When you get about two to three miles past the end of the runway, you'll want to make your second 180° turn to the left. If you keep the same angle of turn that you used in your first turn, you should be perfectly aligned when your 180 is finished. This should put you about two or three miles away from the runway, lined up with it. Pause the game now and read on for a bit.

Angle of attack

Once you are heading the right direction, you're going to need to get those horizontal and vertical bars to form a cross. If they're not already, start to wrangle them into position. Only worry about one of the scales at a time. If your GSD Bar is below the center of the HUD, nose down. If it's above, pull up. Same goes for the LD Bar. If it's to the left of center, move left and vice versa.

While you're watching the ILS bars, keep an eye on the AOA system. Remember, it should be between 10°–13°. When you have a perfect AOA, the center light in the AOA Indexer will light up.

Airspeed

If you manage to get the two scales to form a cross but can't seem to get a perfect AOA, you are probably going in too fast or too slow. Check your AOA Indexer to see which of the two reasons it is. Adjust your airspeed so that you're coming in at about 250 kts.

Using the rudder

Once you get under 450 kts, you can use the rudder pedals on your F-16 to help fine tune your horizontal movement when lining up with the runway. Simply hold down the ⊡ key to apply left rudder or the ⊡ key to apply right rudder. This will slide your plane gently to one side or the other on your approach. Unpause the game now and try to get your AOA aligned. Keep "riding the beam" as you approach the runway.

Aborting

This is where nerves come into play. If for some reason, you aren't approaching at the right angle or your AOA is incorrect, immediately abort your landing. Increase throttle to 80% and pull your nose up. You'll now have to wing around and follow the same procedure for another pass. Don't be too hard on yourself if you have to abort. Landing is tricky business and requires a lot of practice.

Landing

Just before your plane touches down, make sure that your AOA is not less than 8° and your airspeed is between 160–190 kts, or else you'll be doing a nosedive into the runway. Try to aim for the beginning of the runway, so that you'll have a greater distance to stop your plane.

As soon as you touch down, reduce throttle and push the nose of your plane down so the nose wheel comes down on the runway. Immediately after the nose wheel touches the ground, engage your speed brakes and flaps until you come to a complete stop. Now go ahead and set your wheel brakes, so your bird won't roll off the runway. There you have it, a perfect landing! I didn't get the moniker "Threepoint" for nothing, you know.

In closing

This lesson, I set you up to start out almost perfectly lined up with the airfield. In the real world, you won't have that luxury. You need to remember three ingredients (heading, AOA and airspeed) before you get ready to land. With time and practice, you'll know which instrument to view at any given time.

Lesson 4 review:

In this lesson, you learned the following things:

- ✦ Instrument Landing System (ILS) HUD mode
- ✦ Glide Slope Deviation (GSD) Scale
- ✦ Localizer Deviation (LD) Scale
- ✦ Angle of Attack (AOA) System
- ✦ AOA Indexer
- ✦ AOA Indicator
- ✦ Waypoint Indicator
- ✦ Rudder keys
- ✦ Landing approach

The final lesson in this section is a review of the first four. I'll give you some general guidelines, but mostly it'll all be up to you. Good luck.

Review 1: Takeoff–Landing

Now that you've flexed your bird's muscle and learned a few things about her, it's time to check that knowledge. I'm not going to teach you anything new in this lesson — it's going to be strictly review.

You're going to start out on your home runway, take off, circle around to the left, come in behind the runway and land the plane. Simple. I'll be around to help you out if you've got some problems, but I'm handing over the stick to you. And, we're off!

On the runway

Go ahead and power up to 60% and let 'er rip. Kick in the afterburners and pull up when you reach 160 kts or so.

Takeoff

Raise your landing gear and keep climbing at an angle of about 20°. Keep this angle until you reach 15,000 feet, then level off. When you get to 15,000 feet, turn off your AB.

Circle around

As I said in the intro, you're going to circle around to the left and make a landing heading due north (0°). You're going to want to head 270°, then turn to 180°, then veer to 90° before finally heading north again. I'll explain what to do below.

Change heading to 270°
Right now, your heading should be 0°. Bank left until your heading is 270°, then level off.

Change heading to 180°
Go ahead and fly for about a minute or so and then bank left until you come to a heading of 180°. Level off and continue flying.

Pass by the airfield
Keep flying straight and level; then take a look out the left side of your cockpit and watch as you pass by the airfield in the distance.

Change heading to 90°
After you fly by the airfield, keep flying for a minute or so. Now, bank left again until you come to a heading of 90°, then level off again.

Change heading to 0°
Locate your airfield by looking out the left side of the cockpit. Right before the airfield comes into the middle of your view, start to bank left until you are heading 0°. Now, level off.

Engage ILS and begin descent
Turn on your ILS and check how far away you are from base. Right now, you should be about 15 or so miles from your airfield. Remember, you want to be at 10,000 feet when you are 10 miles away, so begin your descent now until you achieve that height and distance. Also, power your bird down to 450 kts when you get there.

Approach (five miles)
Keep the ILS bars in a cross while you make your descent. When you approach five miles from base, slow down to about 270 kts and ease her in.

Approach (two miles)
Once you get within two miles, drop your airspeed to 250 kts and lower your landing gear. Use those rudder controls to fine tune your approach.

Pass over the runway
After you're aligned with the runway, pass over it and make the first of your two 180° turns. Parallel the runway and go about two miles out before starting your second 180° turn. Now, line 'er up and check your ILS bars.

Landing
Your AOA should be between 10°–13° now, but if it isn't, you may want to abort and repeat the procedure. Aim for the start of the runway and when you touch ground, nose the plane forward and reduce speed immediately. Open up the speed brakes and flaps to drop your airspeed. When you come to a stop, engage the wheel brakes and you're finished!

In conclusion
Well that's all. Now, if you want, you can keep running this review mission until you've perfected it or else practice takeoff or landing using Lesson 1 or 4. If you did this review perfectly, congratulations! You've now graduated to weapons school.

Overview: Lessons 5–8

Well, you made it through basic training. By now, you should have a general familiarity with cockpit controls and an overall view of the HUD. These next four lessons are based on concepts you learned in Lessons 1–4, so if you didn't understand something in those lessons, be sure to review them before continuing.

The following four lessons are to establish your combat readiness. We'll go over the standard radar (called Situation Awareness Mode, or SAM), how to read your Threat Warning Indicator to find enemy aircraft, how to select and fire your weapons, all the air-to-air and air-to-ground HUD modes and their operation, and how to use the Padlock View in an A-A combat environment. After you complete these lessons, you should be able to compete with the best of them.

Lesson 5: Weapon Selection and SAM Radar

Ok, hotshot! Now's the time for your real test. It's all well and good to fly about with no enemy in sight, but now you've got to prepare for combat. The first things you need to know before you get in the heat of battle are how to select and fire your weapons as well as how to find enemy aircraft and get their info from your radar scope. Once you master these, you'll be able to figure out where that bandit is coming from and maybe even shoot him down.

This lesson will teach you how to choose weapons from your Stores Control Panel and how to launch those weapons. In addition, you'll learn how to interpret your Threat Warning Indicator and how to read the standard mode of the Radar/Electro-Optical display (aka the REO, or simply the radar).

The type of radar you will be learning here is called Situation Awareness Mode (SAM) radar. SAM radar is the default radar setting of the "Intermediate" skill level. Situation Awareness Display (SAD) radar mode is fully described in **Section II: Instant Action**, while the High Fidelity Radar (HFR) mode is explained in **Section IX: Flight**.

Before you begin

If you haven't done so already, click the Takeoff button now. When you get in the cockpit, pause the game and continue reading the lesson. After you've got some of the basics, I'll tell you when to begin flying around.

Weapon selection and firing

Before you get into a fierce knife fight, you need to know which weapons you have on board and how to fire them. Seems simple, right? Well, to the untrained eye, it can get really confusing. Just listen along for now while I go over it.

Stores Control Panel (SCP)

You can view all of your onboard weapons in the display in the lower-left hand corner of your front cockpit. The Stores Control Panel will tell you not only what you've got, but how many of each weapon you have left.

The top line in the SCP shows what type of weapon is currently loaded, either "A-A" (air-to-air) or "A-G" (air-to-ground). Right after that is the amount and type of the current weapon loaded. The weapons you can see on the SCP may differ because you may select different weapons on different missions.

The second line reads "APG-66" and tells you that your radar is turned on. You may sometimes want to turn your radar to standby to avoid detection by enemy radar and SAMs.

To find out the number and type of every weapon you have on board, you can hit the V key. Unpause the simulation, and keep pressing the V key until you have returned to the SCP's standard display.

Selecting a weapon

Your F-16 carries two basic types of weapons: air-to-air and air-to-ground. Air-to-air weapons include heat-seeking missiles, radar-guided missiles and guns. Air-to-ground arms include missiles, iron bombs, cluster bombs or guns.

To change to your A-G weapons, simply hit the Backspace key. Keep hitting the Backspace key to check out the remainder of your A-G stores. The weapon name will appear on the first line of your SCP. Also notice that the displays on the radar and HUD change each time you select a new weapon. I'll talk about the HUD more in Lesson 7.

You can select your A-A weapons by pressing the Enter key. Just as with the A-G weapons, keep hitting the Enter key to view your A-A stores. Toggle through your weapons systems until the words "4 AIM9M" appear in your SCP. This will select and arm your AIM-9M Sidewinder missiles.

Firing a weapon

I know it's a waste of a missile, but go ahead and launch one of your Sidewinders now by pressing the Spacebar key. If you're using a joystick, one of the buttons will launch the missile and the other one will toggle through your A-A stores.

Whether you are using an A-A or A-G weapon, the Spacebar key will always act as your trigger. Go ahead and pause the game again while I talk about target selection.

Changing targets

In a situation with multiple A-A or A-G targets, you can toggle through targets within radar range by pressing the T key. This Target Select Key will come in handy because there may be times where your targeted aircraft is a lesser threat than another in the area. For example, you may be targeting an AN-12 transport when there's a MiG-29 right at you!

This key works for ground targets as well. You might want to fire a Maverick at a tank, switch to another tank and launch a second missile all on your approach dive. Keep the Target Select Key in mind as I go into Lessons 6, 7 and 8.

Finding the enemy

Ok, now that you know how to select and fire your weapons, you need to be able to locate your foe. Your F-16 has three devices to find out where an enemy plane is: the radar, the Threat Indicator and the HUD. Use the radar first to locate the enemy, and when he gets in range of your weapon, take a look at the HUD and Threat Indicator to see where he is heading. First, I'll talk about your Radar/Electro-Optical (REO) Display.

Radar/Electro-Optical (REO) Display

Directly below your HUD is the REO, simply known as the radar display. The radar is the primary device that you need to locate and lock on an enemy plane or ground target. For now, I'm just going to talk about what the different numbers and such mean on your A-A radar. I'll discuss how to use specific weapon systems in Lessons 6 and 7.

Right now, your radar screen will be pretty much blank, save for a couple of numbers at the top. Unpause the simulation now and keep an eye on your radar. When a light green blip appears on your display, press P to pause again.

Viewing the radar

First, let's go over some basics. In Situation Awareness Mode (SAM), your plane is assumed to be at the bottom of the radar screen pointing "up." The green square is an enemy plane. As enemy aircraft close in on your position, they will move from the top of the radar screen down toward the bottom. When you have achieved a radar lock on the enemy aircraft, the square will turn into a diamond.

Radar ranges

SAM radar is fairly simple because you don't have to manually change the radar scanning range. The radar will automatically change its scanning range between either 20 miles or 10, depending on how far away the closest enemy aircraft is. You can tell how large the scanning range is by looking at the upper left-hand corner of the REO.

This 20 mile range means that there is 20 miles between the top of the radar display and the bottom. Right now, the bogey should be about 15 miles away (about 75% up from the bottom of the screen). Unpause the simulation again and watch as the bogey slowly moves down the screen. Pause the game again when a series of numbers appears on the right-hand side of the REO and the green square changes to a diamond.

REO symbology

Now the upper left corner should read "10 SAM," (Situation Awareness Mode), meaning that the REO has changed to the 10-mile scanning range and is tracking a single target. Since you are within 10 miles of the enemy plane, you'll see the targeting info on the right-hand side of the screen. Your screen should look something like this:
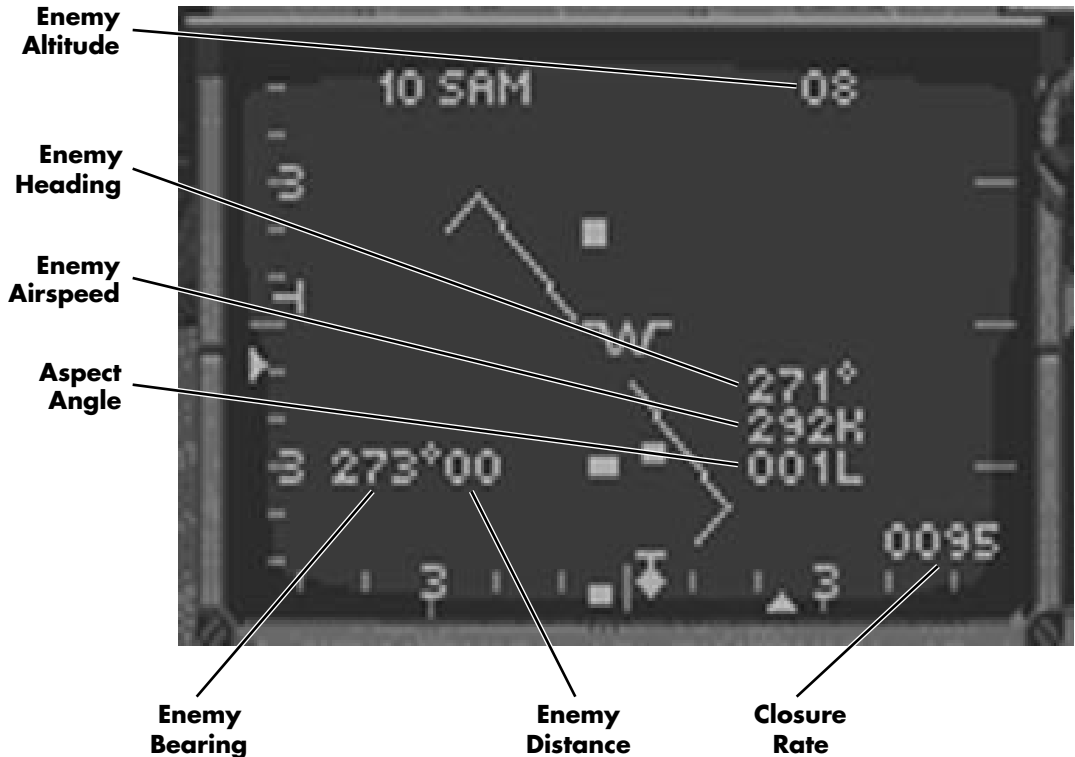
Enemy altitude: The number in the upper right-hand corner is the enemy's altitude (in thousands of feet) above terrain level. It should read somewhere around 10(000).

Enemy heading: This is the heading (in degrees) that the enemy aircraft is flying. You can compare your own heading (on the heading scale) with his to see what direction you need to fly to overtake him.

Enemy airspeed: This shows the airspeed (in knots) of the enemy aircraft. It's useful because you can compare it against your own speed and adjust accordingly.

Aspect angle: This is the horizontal angle measured from the tail of the enemy aircraft to the nose of your plane. Optimally, you want to have the aspect angle be 0° (directly behind the enemy's 6 o'clock). The number of degrees will be followed by a direction (either R for right or L for left).
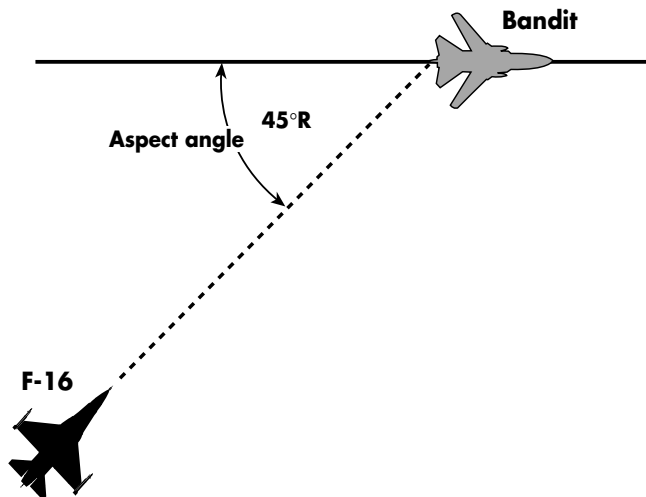
Enemy bearing: This is the compass direction from your F-16 to the enemy plane. In this case, 0° means he is directly in front of you and you're on his six.

Enemy distance: This shows how far away (to the closest mile) the enemy aircraft is. The fourth number up from the bottom right-hand corner of the HUD will display the same distance (in tenths of miles).

Closure rate: This number indicates the amount (in knots) that you are gaining or losing on the enemy aircraft. A positive number means you're closing in, while a negative number means you're losing ground. Closure rate is generally used when you are following an aircraft rather than in a head-on pass, because when you're following someone, you need to know if you're gaining or losing ground.

What does all this mean to me?
Glad you asked. Every readout on the REO is important for air combat, which is why I'm going over all the radar stuff in a separate lesson. For now, keep all these concepts in mind as I go over the Threat Warning System and I'll explain how to actually use everything later.

Threat Warning System
The Threat Warning System has two major components: the Threat Warning Panel and the Threat Warning Indicator.

Threat Warning Panel
This panel has two lights on it that warn you of nearby threats. The LCK (Lock-on) Light flashes if an enemy plane, radar-guided missile or surface-to-air missile (SAM) is locked onto your F-16. You should take evasive maneuvers or activate an electronic countermeasures (ECM) pod if you have one.

The LNH (Launch) Light flashes when a SAM, radar-guided missile or heat-seeking missile has been launched. You should quickly take a look around to find out where the missile is so you can take evasive action, dump chaff and flares, and turn on your ECM.

Threat Warning Indicator

The Threat Indicator is a passive warning device that shows you the position of enemy aircraft, SAMs and radar-guided missiles within 30 miles. Different shaped "blips" can appear in this indicator, each type of blip representing a different threat.

When you look at the Threat Indicator, your F-16 is in the center of the two circles, facing "up" the screen. The top hemisphere of this indicator is the forward viewing half of your aircraft, while the lower hemisphere is the lower half of your plane. The dividing line for the top and bottom hemispheres runs through the wingtips of your plane. Stronger signals are displayed closer to the TWI's center, while weaker radars are displayed toward the outer edge.
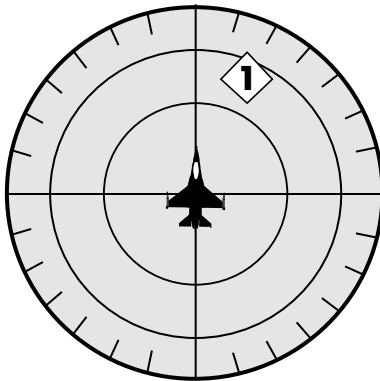
Three different types of blips can appear on the Threat Indicator:

1) Diamond – an enemy plane is within 30 miles of your F-16. Inside this diamond will be a number from 0 to 6. This number corresponds to the radar band the enemy plane is emitting. From this, the computer can roughly determine the type of enemy aircraft.

2) Large green square – a radar installation within 30 miles is painting you. The number inside this square indicates whether that radar is continuous wave (1) or pulse-doppler (2).

3) Small green square – an active-homing, radar-guided missile or SAM has been launched within 30 miles of your F-16.

The Threat Indicator is mostly used when you actually get into a dogfight and to warn you of impending threats. Then, you'll need to use it for "situational awareness" of your combat surroundings.

How to use your radar

This lesson isn't designed to teach you how to engage an enemy or what tactics you should be using. This lesson gives you the enemy plane dead in your sights, so you really won't have to worry about maneuvering. The game should still be paused right now, so we can step our way though the radar acquisition process.

Step 1: Obtain visual sighting

If you look out the HUD, you should see the Target Designator box on the horizon. That's the bogey, just about coming into view. You want to aim your jet toward that box so you can get a good shot off.

In modern jet combat, you only see your enemy for a very short time since both of you are racing at supersonic speeds. Don't worry: he'll get bigger in your sights soon enough.

Step 2: Check your IFF

In actual combat, you've gotta make sure that you're not going to fire on your buddies flying CAP for you. Before you even get ready to launch a missiles, hit the N key. This will check out the targeted plane on your IFF (Identification Friend or Foe) device. If you get a loud "squawk" from your instrument panel, the plane you're targeting is a friendly… don't shoot at him. If you hear nothing, it is an enemy plane.

Step 3: Check distance, bearing and heading

Take a look at the enemy's distance in the REO. The distance should be somewhere around 10 miles. It's important to keep flicking your eye back to this number so you don't overshoot the enemy.

Since the enemy plane is within 10 miles of your F-16, you'll also need to check out his bearing (on the left side of the REO). You want to keep aiming at him, so keep an eye on that number and be prepared to head in that direction. His approximate bearing can be quickly found in the Threat Indicator. Also, take a look at his heading, so you can anticipate which direction he is aiming for.

Step 4: Check relative altitudes

Look at your altitude on the Altitude Scale and compare your current altitude with the enemy plane's altitude. They should be about the same, but if they aren't, you're going to want to correct yours to correspond with his.

Step 5: Check missile lock

You have a radar lock if the blip on your radar screen is diamond-shaped. When you achieve a missile lock on a plane, the circle in the middle of your HUD (called the Aiming Reticle) will start to flash. Keep your target inside the reticle and, as it approaches, fire your missile.

When you use guns, you need to get in really close and lead your enemy before you fire. This is called "pulling lead" or "lead pursuit" and requires you to point the nose of your aircraft in front of the nose of the enemy aircraft so that the bullets and target arrive at the same place. Check out the following diagram.
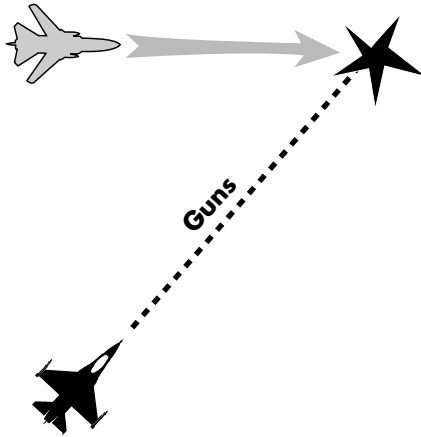
Engage!

Ok, now unpause the simulation and follow the five steps I just mentioned. Make sure to keep the enemy near the center of your HUD. If, for some reason, he goes off the screen, look at the top of your HUD for a line pointing down from a cross. This is the Target Locator Line, and it's pointing in the direction of the targeted enemy aircraft. You can also find out his relative position by looking at the Threat Indicator.

The other numbers on your REO are mostly useful if you are engaging an aircraft from the rear since they display info, such as closure rate and aspect angle, that will require you to compensate to achieve missile lock.

After you've blasted him out of the sky, hit the autopilot to return to base. By the way, did you notice what type of computer-controlled plane you were going up against? That was a late-model MiG, the MiG-27.

One last hint

Keep a steady hand. You don't want to be flailing around on the stick so much that you lose sight of the enemy.

If you didn't manage to grasp the radar concepts, go ahead and keep running the lesson until you've got the hang of it. It is pretty tricky, so don't get disappointed if you don't get it at first. These fundamentals are the basis for the next lesson where we'll go into the different A-A HUD modes.

Other scenarios

Lesson 5's scenario had an enemy plane coming at you head-on. If you want to try the same scenario but with the enemy in a different position, try the following lessons: LESSON5L puts the MiG-27 on your left side heading north, LESSON5R puts the MiG-27 on your right side heading north and LESSON5B puts the MiG-27 directly on your tail heading north.

Lesson 5 review:

In this lesson, you learned the following about your weapons:

- ♣ Stores Control Panel (SCP) and how to view all weapons
- ♣ Selecting A-A and A-G weapons
- ♣ Firing a weapon
- ♣ Changing targets

In addition, you learned the basics of Situation Awareness Mode (SAM) radar:

- ♣ Viewing the radar
- ♣ Radar ranges
- ♣ How to read enemy altitude, heading, airspeed, bearing and distance
- ♣ Aspect angle
- ♣ Closure rate

You also learned about the Threat Warning System:

- ♣ Threat Warning Panel: LCK (Lock) Light and LNH (Launch) Light
- ♣ Threat Indicator and how to read it

Finally, you learned how to use these two systems together:

- ♣ Step 1: Obtain visual sighting
- ♣ Step 2: Check IFF
- ♣ Step 3: Check distance, bearing and heading
- ♣ Step 4: Check relative altitudes
- ♣ Step 5: Check missile lock

Next stop, the different A-A HUD modes. If you understood this lesson, those'll be a piece of cake.

Lesson 6: Air-to-Air Weapons Delivery

The last lesson taught you how to fire your weapons and how to read your REO. This lesson will describe all the different A-A weapons, how and when to use them, and how to interpret their HUD displays.
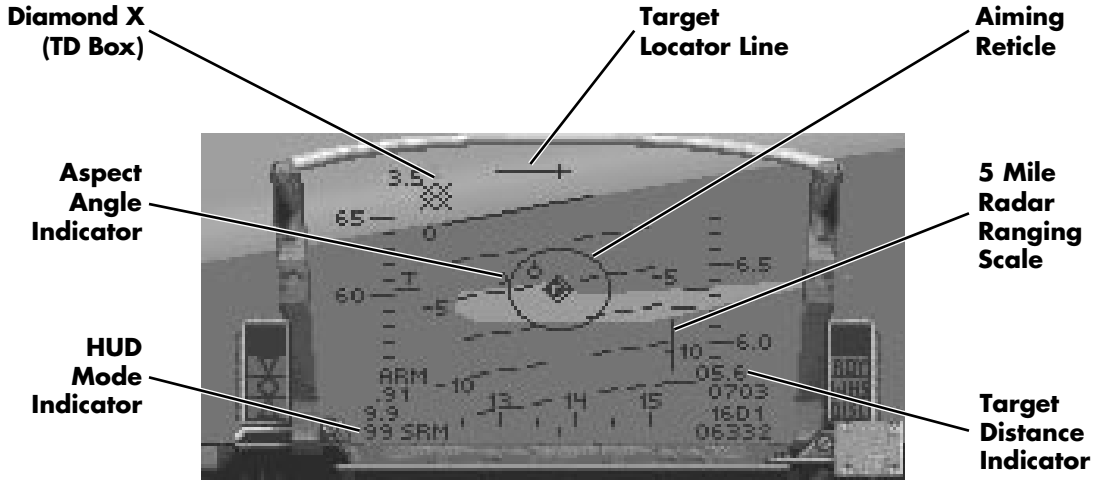
First, I'll talk about basic stuff you'll find in all the A-A HUD modes. Then, I'll go into the A-A missile HUD modes: their characteristics, their strengths and weaknesses, and when and how to fire your A-A weapons. Finally, we'll talk about the A-A gun HUD mode and when it should be used.

In the air

Since you're going to be starting out right in front of a Mirage III, once you get in the cockpit, pause the game and read on.

A-A HUD mode basics

Most of the important weapon firing information is on your HUD. You gotta know how to read it if you want to be successful in air combat. Let's go over the basics first.

Diamond X (TD Box) **Target Locator Line** **Aiming Reticle**

Aspect Angle Indicator **5 Mile Radar Ranging Scale**

HUD Mode Indicator **Target Distance Indicator**

HUD Mode Indicator

Aside from the Stores Control Panel, the HUD Mode Indicator is the easiest way to tell which weapon is currently selected. If any weapon but the A-A gun is selected, there will be a number in front of it displaying how many of that weapon you have left. The last line in the lower left-hand side of the HUD will have one of the following: SRM (AIM-9P or AIM-9M missile), MRM (AIM-120 missile) or DGFT (M61A1 gun).

Target Locator Line

Extending from the small "+" at the top of the HUD, the Target Locator Line helps you find the enemy aircraft you are currently targeted on. You can find the enemy aircraft by following the direction of this line.

5 Mile Radar Ranging Scale

This scale is located to the left of the Altitude Scale and only appears when you are within five miles of an enemy plane. A small caret will appear at the top of the vertical bar and move downward as you approach the enemy. The top of the vertical bar indicates a distance of five miles while the bottom of the bar is zero miles (that is, right on top of you).

Target Distance Indicator

The Target Distance Indicator is the first line in the lower right-hand corner of the HUD. It shows your distance from the targeted enemy aircraft within tenths of miles.

Aspect Angle Indicator

This indicator duplicates the aspect angle reading in the lower right-hand corner of your REO. For an example of aspect angle and how it's measured, see the previous lesson.

Target Designator Box

The Target Designator box indicates where your current target is — if it's within the viewing range of the HUD. If you see the TD box but no target inside it, this means that the target is beyond visual range.

If the enemy aircraft is in your front quarter but off to one side of the HUD, the Target Designator Box will change to a diamond with an "X" through the center of it. This is known as the Diamond X. To change it back to a box, just head toward that diamond until the target enters the HUD again.

A-A missile HUD modes

Your F-16 can carry three different A-A missiles: the AIM-9P Sidewinders, the AIM-9M Sidewinders and the AIM-120 AMRAAM. Each of them has a few HUD items in common which I'll talk about now.

Missile Seeker Head

Within the perimeter of all A-A missile HUD modes, a small diamond represents the missile's seeker head. On the AIM-9M, the seeker head will bounce around the HUD, only coming to rest when it locks on a target. The other two A-A missiles keep the seeker head stationary in the center of the HUD.

Aiming Reticle

The circle in the center of your HUD is called the Aiming Reticle. Optimally, you want your target somewhere within this circle before you fire your missile. When you have achieved a missile lock on your target, the Aiming Reticle will flash. Keep the enemy plane within the reticle and then fire your missile.

The major difference between the displays for the three different A-A missiles is the size of the reticle which is measured in milliradians (MR). The larger the reticle, the easier it is to keep your target within its confines and the easier it is to hit it. Of the three missiles, the AIM-9P has the smallest kill circle (35 MR), the AIM-9M has a 100 MR kill circle and the AIM-120 has a 145 MR kill circle.

Aspect Angle Caret

This indicator graphically shows the aspect angle. With the caret, an aspect angle of 180° is at the 12 o'clock position and 0° is at the 6 o'clock position.
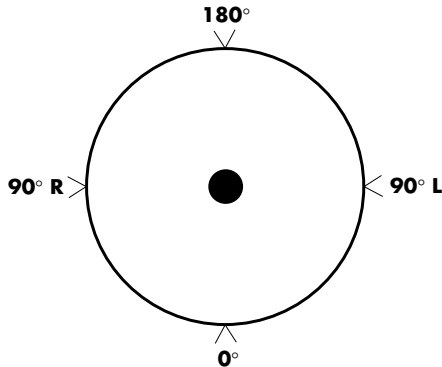
An easy way to figure out the aspect angle is to pretend that the point of the caret is the nose of the enemy plane. For example, if the enemy plane is at the bottom of the reticle (0°), the point of the caret is facing away from your plane, just like the actual enemy plane's heading.

AIM-9P Sidewinder

The AIM-9P Sidewinder is a rear-aspect, heat-seeking missile. Rear-aspect means that you need to shoot at an aircraft's rear quarter for the best chance to hit your target.

Sidewinders make a "growling" sound when they are seeking a target. When they achieve a lock, this growl turns to a high-pitched whine. At the same time, the Aiming Reticle will flash. This is the best time to launch your missile.

The AIM-9P is the most common A-A missile you will find in a campaign setting since they are the least expensive A-A missile (although not as accurate as the AIM-9M or AMRAAM). Therefore, you should have plenty in supply. Their disadvantages are that they are rear-aspect only and have a smaller aiming reticle (both of which make it more difficult to lock onto a target). The effective range of the AIM-9P is 6 miles.

Firing the AIM-9P

Go ahead and unpause the game and aim at the retreating Mirage III. Keep heading toward the enemy until the Sidewinder whines and your reticle flashes. Launch your missile and keep your nose pointed at the enemy plane. Watch as the computer plane explodes into flames. Good shot! Now, go ahead and pause the game again while I talk about the next missile system.

AIM-9M Sidewinder

Unlike the AIM-9P, the AIM-9M is a more advanced heat-seeking missile. The AIM-9M is an all-aspect heat-seeking missile, which means that it's not as important to aim at the rear quarter of an enemy before firing, as it is with an AIM-9P. The major differences between the two Sidewinders are their aiming areas, reticle sizes and availability in a campaign. Also, the missile seeker head will be bouncing around the HUD until it locks on a target and then it will drift toward the Target Designator Box.

The effective range of the AIM-9M is 6 miles, although it can be fired up to 10 miles. Since the aiming reticle is larger than the AIM-9P's, it is easier to lock on an enemy plane. The AIM-9M costs a lot more to build and is in greater demand than the -9P, so they will be in shorter supply in a campaign.

Firing the AIM-9M

If you want, you can unpause the game and then select the AIM-9M missile by pressing the
[Enter] key once. Turn your bird until you are heading due north (0°) and fly for a couple of
minutes. Another Mirage III will appear on your radar scope and in your HUD. Keep him
in your sights, and when you achieve a lock-on, fire away. Another hit! Think you're getting
good at this? Wait'll you try it in *real* combat, bucko. Go ahead and pause the game again.

Jammed Sidewinders

Even though Sidewinders are heat-seeking missiles, their seeker heads are slaved to your
F-16 radar system. This allows you to target a Sidewinder by locking your radar onto a
specific aircraft. The drawback is that if your radar is being jammed by enemy ECM, your
Sidewinders will not lock at all. This problem can be solved by switching your radar to a non-
tracking mode (such as ACM) or by switching your radar off.

AIM-120 AMRAAM

The AIM-120 AMRAAM (Advanced Medium-Range Air-to-Air Missile) is a radar-guided
missile designed to be fired from beyond visual range (BVR). It has an incredible range of
30 miles and a huge Aiming Reticle. In addition, the seeker head will stay in the center of
the HUD until it locks on a target. Then it will drift over to that target and the reticle will flash.

Its two drawbacks are that it's very ineffective at close range and it has an enormously
expensive price tag. This cost factor means that you're not going to get a heck of a lot of them
in a campaign.

Firing the AIM-120

All right, unpause the game and head north again. Choose the AIM-120 missile and watch
your HUD. Soon, you'll see the Target Designator Box on your screen. Aim for it and watch
your reticle. Before you can see the plane, the reticle will flash. Go ahead and launch a
missile at this third Mirage III. The missile should impact just as the Mirage gets into view.
Once you get him, change to A-A guns and then pause the game again.

A-A gun HUD mode

The one major feature of the M61A1 gun HUD mode is the M61 Aiming Funnel. It's pretty
simple to use, so let's go over it now.
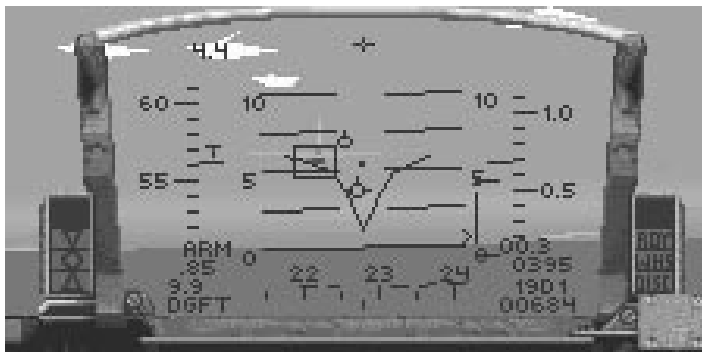
M61 Aiming Funnel

The Aiming Funnel is the series of two lines that intersect in the center of the HUD. Unpause the game, level out and head north. Now, pull up on the stick. See how the two lines trail down the HUD? The bullets from your gun will end up at the smallest point of the funnel.

M61A1 Cannon

You can only use your guns within one mile of an enemy target. Any farther away and you won't hit a thing. Your objective is to get the wingtips of the enemy aircraft between the edges of the funnel. Gun ammo is cheap compared to missiles, so you'll always have enough in a campaign.

You don't want to use your gun on a large aircraft like a transport, because a few bullet holes aren't going to bring down one of those monsters. Reserve the gun for fighter jets or as a last resort.

Firing the M61A1

Unpause the game now and aim for the oncoming MiG-23. When he gets within visual, try to place his wingtips at both edges of the narrow part of the funnel. Then lay into him with the M61A1. With any luck, the aircraft will erupt in flame. If not, keep trying until you get the hang of it.

To finish off

Well, that's all for the A-A HUD modes. They're pretty easy to grasp once you've had a little practice. If you feel you need more work, keep running this lesson and use the different A-A weapons on any of the planes. When you're finished, simply select End Mission from the menu bar.

Lesson 6 review:

In this lesson, you learned these things found on all A-A HUD displays:

- ♠ Master Arm Indicator
- ♠ HUD Mode Indicator
- ♠ Target Locator Line
- ♠ 5 Mile Radar Ranging Scale
- ♠ Target Distance Indicator
- ♠ Aspect Angle Indicator
- ♠ Target Designator Box and Diamond X

You also learned specifics on A-A missile HUD modes:

- ♠ Missile Seeker Head
- ♠ Aiming Reticles and their differences
- ♠ Aspect Angle Caret
- ♠ AIM-9P Sidewinder
- ♠ AIM-9M Sidewinder
- ♠ AIM-120 AMRAAM

In addition, you learned about the A-A gun HUD mode:

- ✦ M61 Aiming Funnel
- ✦ M61A1 Cannon

Next lesson, I'll go into the A-G HUD modes and their operations. Then you'll learn what it's like to be a target, not a fighter.

Lesson 7: Air-to-Ground Weapons Delivery

Last lesson, I went over all the A-A HUD modes and their operations. Now you're going to get down to the nitty-gritty… literally. This is where you'll learn about air-to-mud bombing techniques, when and when not to use certain weapons, and what A-G HUD modes look like.

To begin with, I'll go over basic info on the air-to-ground (A-G) HUD modes and REO. Next, I'll talk about the specific A-G weapons, starting with the various missiles. Then, I'll talk about how to drop iron bombs using the Continuously Computed Impact Point (CCIP) bombing system. I'll conclude with how to operate the rocket launcher and M61 cannon.

This lesson is in two parts: LESSON7A deals with the A-G missiles, while LESSON7B teaches you about the iron bombs and the rocket launcher. Go ahead and load LESSON7A for now.

Flying around

You're starting in the air over Nellis' gunnery range. There are a ton of targets here, so you'll have plenty to shoot at. First, pause the game and I'll talk about your basic A-G HUD mode.

A-G HUD mode basics
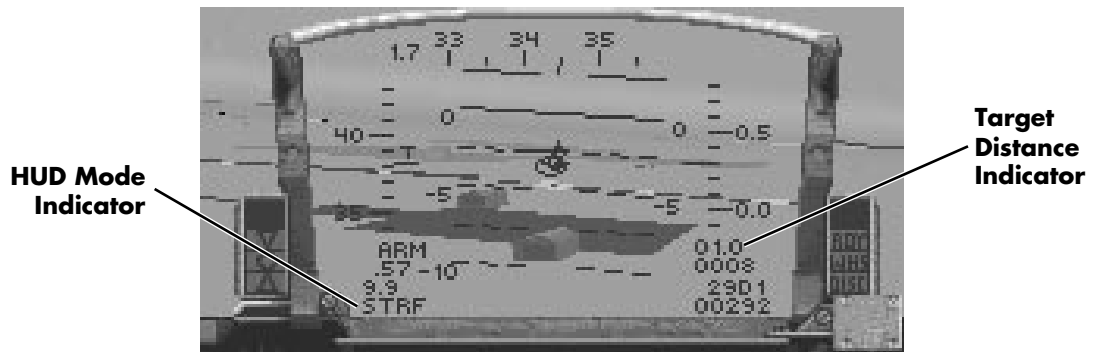
The main difference between the A-G and A-A HUD is the location of the Heading Scale. In A-G HUD modes, the Heading Scale is on the top of the HUD rather than on the bottom. This may seem weird at first, but it does make sense. When dropping iron bombs, the aiming cue is usually at the bottom of the HUD. If the Heading Scale were there, the display would be too cluttered and your view of the aiming cue would be obscured.

Two general things are found on all A-G HUD displays:

HUD Mode Indicator

The function of this indicator is the same as in the A-A HUD display, but the display will be one of the following: CCIP (Mk82/82HD/83/84 iron bombs, CBU-84 cluster bomb and LAU-5003A rocket launcher), E-O (AGM-65B missile and GBU-15 guided bomb), A-R (AGM-45A and AGM-88A anti-radiation missiles), I-R (AGM-65D missile), DUR (BLU-107/B demolition bomb) or STRF (M61A1 cannon).

Target Distance Indicator

In certain A-G HUD modes, the Target Distance Indicator appears to show you the distance to your current target.

Ground Map radar

The Ground Map (GM) radar is used to find and identify ground targets. It has a 20-mile range and you can zoom in to 16x magnification. A complete description of Ground Map radar can be found in **Section IX: Flight**.

A-G missiles

Your F-16 can carry four different types of A-G missiles: the AGM-65B Maverick, the AGM-65D Maverick, the AGM-45A Shrike and the AGM-88A HARM. Since each class of weapon (Maverick and anti-radiation missiles) works in different ways, we'll talk about them separately.

AGM-65 Mavericks

Both of the Maverick missiles have a maximum range of 12 miles and are used on smaller ground units such as trucks and tanks. They can also be used to hit bunkers, but they aren't so hot against bridges or large buildings. The main difference between the two is the method they use to track a target and when they should be used. Unpause the game now and hit the [Backspace] key until AGM65B appears in the Stores Control Panel. Then go ahead and pause again.

AGM-65B Maverick (Electro-optical)

The electro-optical (EO) version of the Maverick is generally used in daytime and good weather conditions. Since the Maverick uses a TV sensor in its nose, it does not track as well in the nighttime as it does in daytime. It also the better choice when firing at a target that's against a large heat source (like the desert floor) since the infrared signature will not fool the missile.
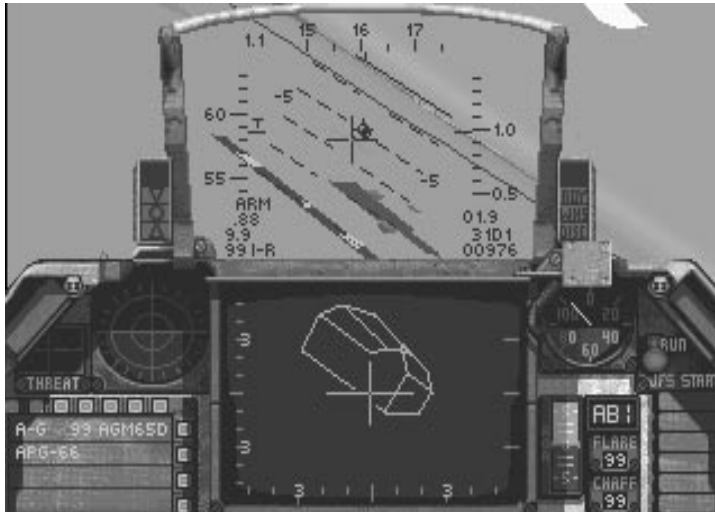
AGM-65D Maverick (Infrared)

The infrared (IR) version of the Maverick is primarily used in the nighttime where the heat signatures of various ground object is more pronounced and not obscured by the earth's heat. It also can be fired in bad weather because it tracks solely by IR.

Firing the AGM-65 Mavericks

Right now, we've only loaded the AGM-65B version of the Maverick, but both types work the same way. Go ahead and unpause the game. You should be at about 3,000 feet, heading due north (0°). Start pointing your nose earthward and look for some brown specks on the ground. (Green and gray tanks are the good guys, and black tanks are already destroyed.) That's a tank park, ripe for the picking. Aim the cross hairs at one of the tanks and watch your REO. When the image of the tank appears in the REO, go ahead and fire by pressing the Spacebar. Both of the Mavericks are fire-and-forget missiles so you can press T to switch to another tank and launch another missile. The locking system is fairly automatic, so it's a no-brainer to hit those sitting ducks. Pause the game again while I talk about the radar-hunters.

AGM-45A Shrike and AGM-88A HARM

These two missiles are designed for use against radar installations and mobile radar units. The primary differences between the Shrike and the HARM are their maximum ranges, their availability in a campaign and which type of radar targets they are effective against.

AGM-45A Shrike

The Shrike has a maximum range of 12 miles and is only used against continuous wave (CW) radar. CW radar is used by almost every enemy defense system except the SA-8 SAM. You're more likely to get these missiles in a campaign because they cost a whole lot less than the HARM.

AGM-88A HARM

The HARM's range is a whopping 30 miles and is effective against both CW radar and pulse-doppler (PD) radar emissions. Its broad range of targets and expensive price tag make it difficult to obtain in a campaign setting.

Firing the AGM-45A and AGM-88A

Unpause the game and hit the Backspace key until AGM45 appears in the SCP. At first glance, the Shrike and HARM HUD modes look like the Maverick HUD modes. You'll notice that the cross hairs automatically track to the nearest radar-emitting target. That's the main HUD difference between these missiles and the Mavericks. Also, if you lock onto a radar-emitting target and that target leaves the HUD's region, the lock-on will remain as long as it's within the forward arc of your plane. The Mavericks will break lock if the target is outside of the HUD.

Right now, you should be at about 2,000–3,000 feet. Once a target is acquired (when the cross hairs move to a radar-emitting target), go ahead and fire away by pressing Spacebar. With a HARM, you can be a lot farther away from the target before firing because of its long range. Circle around again and take another shot if you missed. Then, go ahead and select End Mission from the FILE menu and load LESSON7B for the second half of this lesson.

A-G bombs

With free-fall munitions, you've got a lot of choices: Mk82, Mk82HD, Mk83 and Mk84 iron bombs, CBU-84 cluster bomb, and the BLU-107/B Durandal anti-runway bomb. Each type of bomb is used in a different situation, but the method of dropping them is exactly the same. Of course, you can't drop iron bombs if your plane is upside-down or inverted.

Mk82 iron bomb

Mk82s are generally used against soft targets such as infantry and light armor. It can also be used against small buildings, but then you should drop a few just to make sure. You can get a lot of Mk82s in a campaign since each F-16 can hold up to 24 of them.

Mk82HD Snakeye

The Snakeye has the same amount of explosive as the standard Mk82, but this bomb is used for low-altitude releases. Since the Snakeye has fins to slow down the bomb, it will always land far enough behind your plane that you won't get caught in the explosion. You can use this bomb against the same targets as the regular Mk82.

Mk83 iron bomb

The Mk83 is a good bomb to use against medium-sized targets such as average buildings, petroleum, oil and lubricant (POL) tanks and railroad shelters. One thing to think about is that this bomb weighs twice as much (1,000 lbs) as a Mk82. So, don't lug the 83s around if you could be using the 82s instead.

Mk84 iron bomb

This is the largest and heaviest of the iron bombs. You can use Mk84s on the largest buildings, power plants, bridges, bunkers, factories and protected aircraft hangars. These suckers make one humongous crater when they land. Their major drawback is that they weigh nearly 2,000 lbs each so your Falcon'll fly like a stuffed pig.

CBU-84 cluster bomb

When you release a cluster bomb, you're not just dropping one single weapon: you're dropping over 200 little bombs. The CBU-84 is great against a group of lightly armored vehicles or infantry because the CBU disperses over a fairly wide area and hits a lot of targets.

BLU-107/B Durandal

The Durandal's only use is against runways. Release this weapon just like the other iron bombs, but the Durandal's effect kicks in on impact. It buries itself in the runway and then explodes outward, making repairs far more difficult than a standard iron bomb.

Before you start

First thing you need to do is find a target to hit. In this part of the lesson, you'll be starting at about 5,000 feet with a number of targets due north. I've given you a number of Mk82s to play around with. Don't drop 'em all in one place.

Dive down a bit until you see some specks in the distance. That's the same tank park you hit in the first part of this lesson. Go ahead now, unpause and select your Mk82 bombs. Then pause the game as I explain how to ripple your bombs.

Rippling bombs

Ripple bombs when you want to drop a lot of bombs over one target. For example, if you've got 24 Mk82 bombs on your F-16, you can set the ripple anywhere from 2–24 (in multiples of two). This way, you won't have to keep flying back just to drop a couple bombs.

You can increase and decrease the ripple count by pressing the ' and ; keys respectively. The ripple number is on the second line of the Stores Control Panel, displayed as "R" and then a two-digit number.

Dropping bombs

All the bombs I just talked about are released using the Continuously Computed Impact Point (CCIP) method of bombing. With CCIP, there are two major stages before a bomb is released: the target designation stage and the release stage.

Target designation stage

You'll notice a couple of new features on your HUD: the Bombsight and the Displayed Impact Line. The Bombsight is the circle and dot at the bottom of the HUD, while the Displayed Impact Line is the vertical line that is above the Bombsight. The Bombsight is also known as the CCIP Pipper or "death dot."

First, dive down a little so that you can see the tanks a little better. Then, line up the pipper with the tank and designate the target by pressing Spacebar. This will change the way your HUD looks.

Time Impact Bar

Display Impact Line

Bombsight
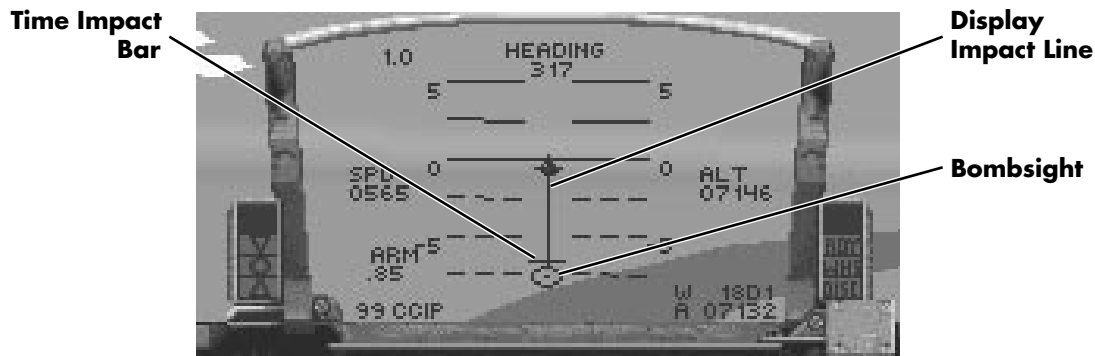
Release stage

Now that you've chosen a target, you need to release your bombs. You may have noticed that the Displayed Impact Line has lengthened to the full height of the HUD. A horizontal line called the Time Impact Bar should be about halfway between the Center Point and the top of the HUD. The Time Impact Bar lets you know when the bombs are going to be released. If you keep flying straight and level, the bar will slowly move down the Displayed Impact Line until it reaches the Center Point, at which time the bombs will drop. If, however, the Time Impact Bar is twice as thick as normal, your onboard computer is notifying you that it isn't a good time to drop bombs because of your plane's awkward position in relation to the target.

You can also drop the bombs prematurely by pressing the Spacebar. Remember, the greater the angle of descent you have before choosing the target, the less time before your bombs impact after release. After you've dropped some Mk82s, go ahead and change weapons so that the SCP reads LAU and then pause the game again.

A-G rockets

While the HUD Mode Indicator still displays CCIP, the firing method for the LAU 5003A rocket launcher is very different than that for the iron bombs.

LAU 5003A rocket launcher

Each LAU pod you load onto your aircraft holds 19 small air-to-ground missiles. Since you load them in pairs, you'll have a minimum of 38 rockets when you load 'em. Since you fire them individually, don't worry about wasting your shots. The LAU's rockets are most effective against soft targets such as light armor, infantry, trucks and jeeps.

Firing the LAU 5003A

Wing around to the tank park again, at about 2,000 feet, and look for some jeeps. If you can't find any, go ahead and look for some tanks. For this demonstration, it doesn't really matter what you shoot at. The center of your HUD has a fixed pipper showing the direction of your missiles. Point your pipper at the target and launch a few missiles by pressing the Spacebar a few times. Fairly simple, isn't it? Once you've shot up a few targets, fly back to about 2,000 feet, change weapons so that the SCP shows M61 and then pause the game again.

A-G gun

The HUD mode for the A-G M61A1 cannon looks very similar to the HUD mode for the LAU, but the difference is that the M61A1 pipper moves around based on which direction your F-16's nose is pointing. The cannon isn't very effective in A-G combat, being used only to strafe infantry and other very soft targets. Generally, you're not going to use your M61 cannon in A-G combat unless you are otherwise out of ordnance.

Firing the M61A1 cannon

To shoot up some targets, wing around again and look for some trucks. When you find them, drop down to 1,000 feet and point your nose at the trucks. After you get them in your sights, hold down the [Spacebar] as you riddle them full of holes. If you drop below 300 feet, pull up and swing around again.

A final word

If you have any other questions about any of the A-G HUD modes, you might want to check out **Section IX: Flight** for more details or rerun these two lessons. A-G attacks, especially CCIP bombing, is a tricky thing. It takes a lot of time and practice to perfect. Keep working at it: in a while you'll be bombing things left and right.

Lesson 7 review:

In this lesson, you learned these things about the A-G HUD modes:

- ♣ Master Arm Indicator
- ♣ HUD Mode Indicator
- ♣ Target Distance Indicator

In addition, you learned how to use the following A-G missiles:

- ♣ AGM-65B Maverick (EO)
- ♣ AGM-65D Maverick (IR)
- ♣ AGM-45A Shrike
- ♣ AGM-88A HARM

You also were instructed on how to use the various A-G bombs:

- ♣ Mk82, Mk82HD, Mk83 and Mk84 iron bombs
- ♣ CBU-84 cluster bomb
- ♣ BLU-107/B Durandal

Finally, you were taught how to use the A-G rocket launcher and A-G gun:

- ♣ LAU 5003A rocket launcher
- ♣ M61A1 cannon and strafing

In the last lesson, I'll give you some pointers on how to use the Padlock View for dogfighting. Just wait… it'll knock your socks off!

Lesson 8: Padlock View

Ok, here you are in your eighth and final lesson. Don't think this is the least important, though. Although you don't absolutely need the Padlock View for air-to-air combat, once you've tried it, you'll never go back to dogfighting in any other view. Yes, it's that good.

This lesson will cover all about how to use the Padlock View, its four windows, where to look and when. It'll also cover the best (and worst) times to use this view as well as a brief description of how to use the Padlock View for landing. Go ahead and hit Takeoff to begin, and then pause the game.

What is the Padlock View?

Some of you are probably wondering where the term "padlock" came from. It's an old fighter jock term for "keeping your eyes glued to the target." This view is designed so that you'll always have the enemy in your sights.

Picture yourself in the cockpit of an F-16. Its bubble canopy and reclined cockpit seat give you the ability to swivel your head almost completely around and allow you to see 360° around you. That's what the Padlock View simulates: the sense of complete vision in combat. This brings me to the three rules of air combat. (Thanks to Hollywood, Club, Dooley and the rest of the guys at Fightertown, USA!)

The golden rules

You need to remember three things in air combat. Even if you forget any of your other training, you must not forget:

1. Lose sight, lose the fight.

2. Speed is life.

3. Always look good.

All three of these can be directly related to the Padlock View. I'll go into these rules now.

1. Lose sight, lose the fight.

This axiom is, by far, the most important of the three. In air combat, you need to keep your eyes glued to the target, or you're history. For example, let's put you in a head-on, one-vs.-one dogfight. If you were looking through the Front View, when the enemy plane closed and then shot by, you'd lose him. You could take a guess as to which way he turned and try to compensate, but with your limited field of view, you could never be sure and might not hear from him again…until he shoots a missile up your tailpipe.

With the Padlock View, the only time your enemy may disappear from view is when he flies beneath your field of view. Even then, you'll only lose him for a matter of seconds until you padlock on him again. In a dogfight, your attention should be focused only on the enemy plane. Everything else — the ground, sky, birds, whatever — is secondary. You'll tend to rely heavily on your peripheral vision to view all of your displays while keeping your eyes focused on the enemy.

2. Speed is life.

The worst situation happens when you're in a heated one-vs.-one encounter, following the bandit into the vertical, and you stall out due to lack of airspeed. While you're dropping like a rock, he'll be on your rear so fast, it'll make your head swim. Always keep a close eye on your airspeed. Before engaging in a dogfight, you want your airspeed to be at least 400–450 knots. In the Padlock View, you can see your airspeed in the upper left-hand window.

When you go into the vertical (climb rapidly), you bleed off airspeed. In order to maintain a sufficient dogfighting speed, you'll need to keep your hands near the throttle and probably the afterburner switch. If you're chasing a bandit and start to lose airspeed, kick in some more RPMs or hit that AB switch to keep your airspeed somewhere between 400–450 knots. Anything more than 450, and you're a human rocket. You'll overshoot enemy aircraft, giving them a perfect opportunity to take you down. Speeds less than 400 are fine for tight, high-G turns, but when you start dropping toward 300 or 200 knots, you won't have enough energy if your bandit heads skyward.

3. Always look good.

A fighter pilot is only as good as his last run. Mistakes are rarely forgotten and usually end up becoming your moniker. You need to keep your cool, have a steady hand on the stick, not waste your weapons and bring your bird back in one piece. You'll never get marks for oversteering or plowing into the ground by accident.

In the Padlock View, you can tell your angle of climb or dive, what type of aircraft you're locked onto your relative position to the horizon and your altitude. When flying, check these out constantly to make sure you're on the right track and not skimming the trees.

Components of the Padlock View

Unpause the game now and press $\boxed{8}$ (or $\boxed{*}$ on the numeric keypad) to go to Padlock View. Then pause the simulation again and continue reading.

Padlock View has four main windows, three small ones at the top and a main lower one. Each one of these is essential to use the Padlock View effectively.

Padlock Status Window   **360° Window**   **Target Locator Window**

Main Padlock Widow
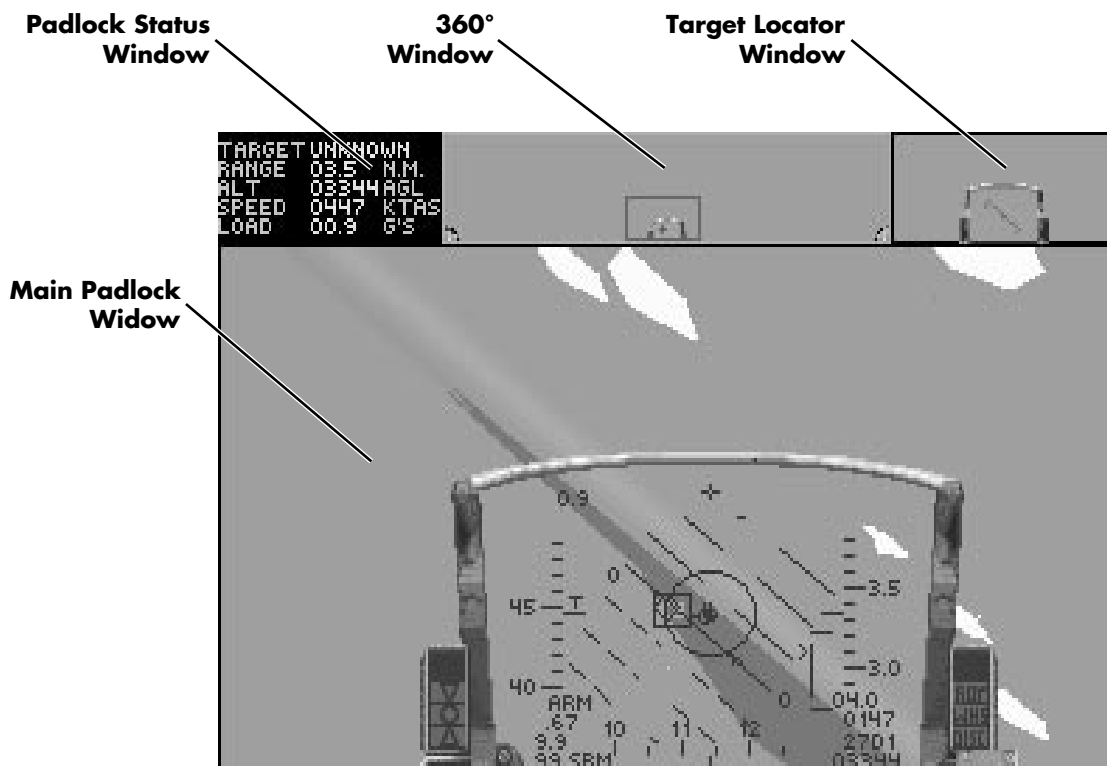
The upper left-hand corner window is called the Padlock Status Window. It displays vital information about the current target and its range as well as your present airspeed, altitude and G load.

The upper center window is the 360° Window. It shows you where the Main Padlock window is in relation to your canopy. A tiny representation of the HUD is located in the center of the 360° Window, while the rear seat is split on the right and left sides of the window.

The upper right-hand corner window is the Target Locator Window. This has two major functions: a target locator line to find enemy planes and an artificial horizon to determine relative position to the earth.

The lower window is the Main Padlock Window. This is where your eyes are looking. If an enemy plane or one of your wingmen is within range, your eyes will lock on that target and

follow it wherever it goes. The target will stay roughly in the center of the window as long as it doesn't fly under your aircraft. If it flies underneath your bird, you'll lose sight for a moment but acquire your target again after it reappears in view.

Let's go over each of these in detail and I'll explain how they work together.

Padlock Status Window

This window is your information on the world. It's mostly used for checking out stuff about your plane and your enemy.

Target: This is the type of aircraft you're currently targeting on. When there's no target within range, it'll display the word NONE. If you aren't in visual range of your target, this line will display the word UNKNOWN. Otherwise, it'll give you the name of the plane you're looking at.

NM: This number is the range (in tenths of nautical miles) to the targeted aircraft.

AGL: This shows the current altitude above terrain of *your* aircraft. The Alt line is the most important line in this window since it's fairly easy to lose track of your altitude when you're dogfighting and your HUD isn't always in view.

KTAS: This is your current true airspeed (in knots).

Gs: This shows the number of Gs you're pulling.

360° Window

The 360° Window shows your viewing range in the horizontal axis only. Your HUD is in the lower center of the window, while the back of the seat (the Rear View) is split on either side. The effect is as if you took a panoramic picture of the landscape. The Main Padlock Window viewing area is represented by a red area known as the Targeting Rectangle. If there is a targeted plane in sight, it will appear in this rectangle as a "+" sign.

Targeting Rectangle

HUD

Rear Seat
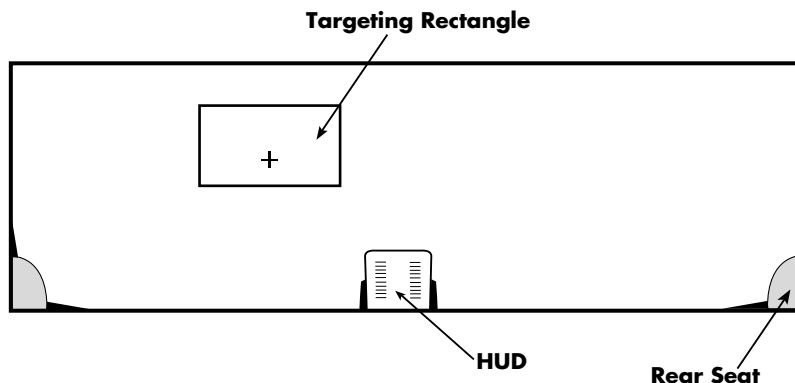
Use the 360° Window to determine the direction of your targeted aircraft. With the Padlock View, you want to get the red rectangle directly over the small HUD in the center of the window so you can fire on the enemy target.

Target Locator Window

The Target Locator Window has two main purposes: to determine the direction of the targeted aircraft and to show your aircraft's orientation as compared to the horizon. Imagine this as a miniature version of the Front View. The tiny HUD in the center of this window will display a red Target Locator Line that shows the direction of your targeted aircraft. It also has a green bar that shows your relative position to the horizon.

In combat, you want to pull your aircraft toward the point of the Target Locator Line. If the targeted aircraft is behind your F-16, the red line won't be there, but the word "REAR" will appear above the HUD. In addition, if your speed brakes are engaged, the word "BRK" will appear. If your afterburner is on, the word "AB" will appear.

Main Padlock Window

The Main Padlock Window is where your eyes are currently looking. Your vision will be "padlocked" on the targeted plane, regardless of where he goes. If he goes underneath your aircraft, you will lose sight of him for a moment, but when he reappears, you will regain "tally" (sight). In combat, you'll probably only look at this view once you have maneuvered your opponent directly in front of your aircraft.

The plane you're targeting will be highlighted by a small red box. If your radar is locked onto the target and the enemy is within the front quarter of your F-16, the red box will turn to green. When this box turns green and your Aiming Reticle begins to flash, launch your missile.

Using the Padlock View

Now that you know the features of the four windows, let's put that knowledge to work.

No enemies in sight

Since you're flying straight and level, you'll notice your HUD in the Main Padlock Window is motionless and in the bottom center of the window. The Targeting Rectangle in the 360° Window will remain in the lower center of that window, while the Target Locator Window will have the same orientation as the Main Window.

Unpause the game, switch to your AIM-9M, and then go ahead and make a gentle bank to the left. Notice how the Main Window and the Target Locator Window move in unison? Since there isn't a target in sight, these two windows will act as one. This, however, will change radically in combat. Fly around a bit and try to get a feel for how the windows work in relation to your stick movements. When you're not in combat, it's fairly simple to operate.

After you feel comfortable with flying around in this view with no enemies, engage the autopilot. After a bit, the autopilot will fly due north and your view will suddenly be tracking an enemy MiG-23. When you see the focus of your Padlock View windows shift to this enemy plane, pause and then continue reading.

First engagement — single bandit

Right now, you're padlocking on an computer-controlled MiG-23 in the main window. If you look to the 360° Window, you'll see him just to the right of the miniature HUD, while the Target Locator Window will have the Locator Line pointing to the right.
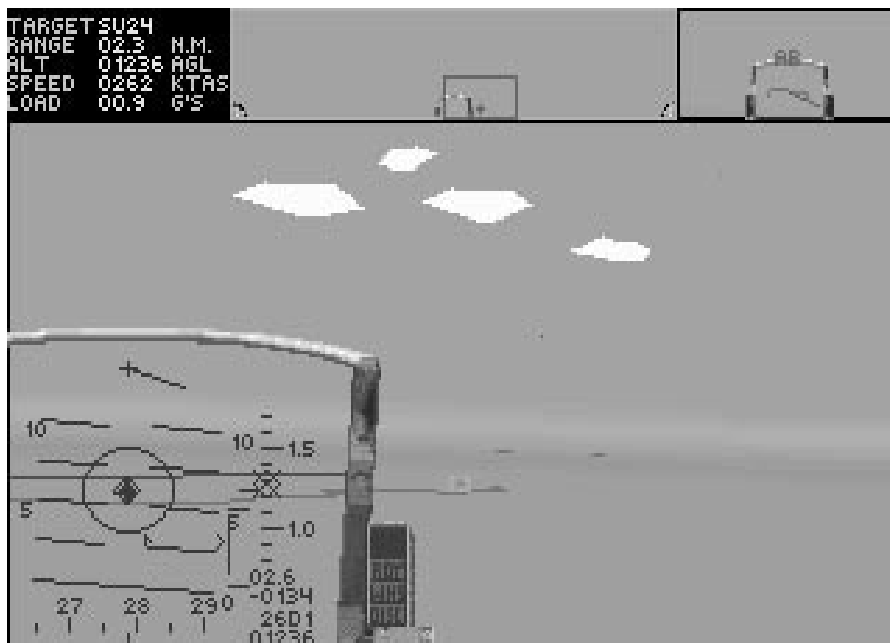
Notice that the HUD in your Main Window shifted off to the left of you. This means that the front of the aircraft is to your left, while your eye position is focused just off the right side on the enemy plane. Unpause the game now and try banking to the right. You'll also notice that when you bank to the right, the horizon in your Main Window will move upward.

As with any A-A engagement, since you want to get behind the bandit, your best bet in this situation is to pull in the direction the Locator Line is pointing. Keep banking right and pulling in the direction of the Locator Line. You'll notice that the Targeting Rectangle beginning to move towards your HUD. Continue pulling along the Locator Line until the Targeting Rectangle is over the miniature HUD. At this time, your HUD will appear in the Main Window.

Try to get the MiG within your reticle and wait for the red box to turn green. Then, when the Aiming Reticle flashes and you're within four miles, launch that AIM-9M. Keep aiming at him until you see the missile hit. See, no problem! Pause the game again and keep reading.

Second engagement — multiple bandits

Ok, now that you've had your taste of action using the Padlock View, we're going to throw a twist in. Next, we're going to give you a MiG-23 and a MiG-27 to deal with. They'll be coming at your from either side in a head-on engagement so you'll have to decide which one to engage first.

When to use the Padlock View

Anyway, unpause the game, switch to Front View and turn on your autopilot. This'll turn your bird north for a while, so you'll be waiting a bit. Once you see some bogeys on your Threat Indicator, switch back to Padlock View, pause the game again and read on.

Generally, when you're on a mission and not in A-A combat yet, use your Front View. You don't want to switch to your Padlock View until you're sure that there are some enemies in visual range or you gain tally on them.

Changing targets in a multiple-bogey engagement

You can change the target you're viewing in the Padlock View by pressing the ⊤ key. This will switch to the next nearest target in your viewing range. If you want to rescan the area for the greatest threat to you and your F-16, hit the ⑧ key. When you're engaged with multiple threats, you'll want to switch back to the Front View after you down each plane to see what the greatest threat is. Then you should return to the Padlock View for combat.

Prepare for combat!

Here we go! Generally, you don't want to take part in a one-vs.-many dogfight, but for the purposes of this lesson, I just want to let you know of the possibilities.

Anyway, now that you're in Padlock View, choose one of the two enemies and start making your turn toward him. Keep using the fundamentals I talked about before: follow your Locator Line and draw the Targeting Rectangle in so that your HUD appears in the Main Padlock Window. Another thing to remember about one-vs.-many dogfights is that you want to dispatch enemy planes as quickly as possible. So, when you draw the first bandit into your sights, launch a couple of missiles at him and then keep your eyes glued for the next bandit.

Not all A-A missiles will destroy an enemy in one hit; it may take multiple missiles to down some aircraft. If you don't obliterate him with your missiles but see him going down in flames, switch to the second bandit right away by using the ⊤ key. The Padlock View will follow your enemy down into the dirt unless you switch targets.

Odds are that if you didn't pay attention to the second bandit, he'll probably be on your six. Lower your airspeed to around 400 kts and make some high-G horizontal maneuvers. Jink him off your tail and try to draw him to the front of your aircraft. After you get him there, increase airspeed and move into firing position. Once you've tagged him, switch to the Front View to check out your Threat Indicator. It's good to get in the habit of switching to the Front View to scan your REO and Threat Indicator for approaching bogeys.

In conclusion

The Padlock View is a useful but tricky view. Because it takes a lot of practice to master, don't be discouraged if you don't get it all at once. Take it slow. Keep practicing this lesson until you get the hang of it. If you find that you still don't understand, you might take a look at the description of Padlock View in **Section IX: Flight**.

Lesson 8 review

In this lesson, you learned about the golden rules and how they apply to air combat:

- ♣ Lose sight, lose the fight
- ♣ Speed is life
- ♣ Always look good

You also learned about the four windows in the Padlock View:

- ♣ Padlock Status Window
- ♣ 360° Window
- ♣ Target Locator Window
- ♣ Main Padlock Window

Finally, you were instructed about the Padlock View in the following situations:

- ♣ No bandits in sight
- ♣ Single bandit engagement
- ♣ Multiple bandit engagement

Congratulations! You've completed the last of the eight lessons we're giving you. Before you can earn your wings, however, you need to complete the "final exam."

Review 2: A-A/A-G engagement

Ok, here you go. This is the final! This review is going to use all your skills and knowledge to complete, so if you aren't sure about anything I've talked about, go back and read over those lessons.

Your final is going to cover the works: takeoff, following waypoints without the autopilot, destroying a nuclear power plant, the return trip to your home airfield and landing. Along the way, you may encounter a number of aircraft, both friendly and enemy, so be alert to their presence. Good luck.

Before you start

One thing about this final, don't be using your autopilot during this test. I'll know if you've been relying on it so don't try to pull a fast one.

Takeoff

Here you are in your familiar cockpit on the runway. Go ahead, take off and bring 'er to 10,000 feet. When you reach 10,000 feet, check out your Waypoint Caret to find the direction to the next waypoint.

Stay in the Front View for now and switch to your AIM-9Ms. If, at any time along your route, you happen to see anything on your Threat Indicator, switch to the Padlock View when you get within visual range and use your IFF check to see if they're friendly or enemy.

Waypoint one

You'll be heading north right after your first waypoint so keep an eye on your Waypoint Indicator to see how far it is to your target area at waypoint two. When you get within 10 miles of the second waypoint, change to the Front View, switch to your Mk84 bombs and prepare for your bomb run.

Waypoint two — target area

When you get within two miles of your target, you should be able to see the twin towers of the nuclear facility. Point the death dot on the base of the first tower and press Spacebar to designate the target. Level out at about 2,000 feet and fly straight over the tower.

After the bomb is released, take a look out your Rear View and see if you got the target. If so, turn around again and do exactly the same thing to the other tower. Remember, since you've only got two pairs of Mk84s, there isn't any margin for error. In a combat situation, you're never going to be hanging around a hostile area to see if you hit your target — that's a sure way to be a trophy in the landscape.

When you've taken your shots at both of the targets, change back to your AIM-9Ms and head for the third waypoint.

Waypoint three

When you hit the third waypoint, you'll be heading south for your home base. It's a long way, but don't become complacent simply because you nailed your target. Returning home is half the trip.

Waypoint four — landing

As soon as you get within 10 miles of your airbase, start your landing approach. After you've landed, engage the wheel brakes and select "End Mission." Now check out how you did in the Debriefing screen.

Debriefing

Here, you'll find out if your mission was a success or failure. You'll also see if you bagged any bandits or destroyed any friendly aircraft. If you got both the towers, congratulations again. You can now call yourself a pilot. If you missed the targets or were shot down, well, go ahead and try again. Keep trying until you complete this mission. If you're having trouble with a certain aspect of this mission, you might want to review some of the previous lessons.

Well, it's been fun. I'd like to extend my thanks and wish you luck in the future. Remember, if you ever need some brushing up on your skills, I'll always be here at Nellis. Take care, and check six!

RED FLAG

Red Flag introduction

Red Flag is an air combat weapons training school. The actual Red Flag is an annual exercise held at Nellis Air Force Base in southern Nevada. Pilots from bases around the world visit Nellis AFB to pit their skills against the resident Aggressor squadrons. The Red Team, made up of highly experienced pilots, simulates the tactics used by air forces hostile to the United States against the visiting Blue Team pilots in a mock mini-war. Our version of Red Flag is designed primarily as a training center and mission editor. We've already created a number of training missions that you can fly, which cover many aspects of your F-16 from basic flying to dogfighting and bombing skills. These training missions are discussed in depth in **Section VI: Air Combat School**. In addition, we've also given you the ability in Red Flag to create your *own* missions.

Red Flag training can be used to improve the "skills" of pilots in your squadron. If they are successful in certain aspects of their mission, the relevant ability scores (i.e., bombing or dogfighting) will increase. If they fail or are "shot down," their skill level in these areas may decrease. Red Flag is not a lethal exercise — the only way you can be killed here is by colliding with the ground.

This section of the manual deals with how to load and fly our pregenerated missions as well as how to create your own missions from scratch.

How to get here

Red Flag can be entered from the War Room once you have selected a squadron. Simply move the pointer over the Red Flag monitor and either click a mouse button or press [Enter] on the keyboard. If nothing happens, be sure that a squadron patch is displayed in the far right monitor in the War Room. If the monitor says SQUAD, click it to select a squadron.

Red Flag Control screen

The Red Flag screen allows you to load, save and delete mission files. You can create or edit a mission by entering Nellis Command, and you can review mission action with ACMI. After you create your Red Flag mission, you will also select pilots for your aircraft, load the planes with ordnance and then hit the runway.

Clear Mission

Click on Clear Mission to create a new mission from scratch. It will remove all mission data from the map (save for one Allied and one Enemy flight of aircraft). After selecting this button, select the Nellis Command button to edit your mission.

Load Mission

To load an existing mission, use the scroll arrows on the side of the small video screen to highlight the name of the mission file you wish to load. Then select the Load Mission button. Either edit the mission by selecting Nellis Command or assign pilots to your F-16s by selecting F-16 Pilots.

Save Mission

To save a mission you have created, select the Save Mission button, type in a name for the mission (maximum of eight characters) and then hit Enter.

Delete Mission

If you want to remove one of the missions permanently, highlight the mission name on the small video screen with the scroll arrows and then select Delete Mission.

Nellis Command

To enter the mission editor, select the Nellis Command button. You can edit existing missions you have loaded, or you can create new missions from scratch in Nellis Command.

ACMI

If you have just finished a mission and want to replay the parts you have videotaped, select the ACMI button to access the ACMI area (see **Section XI: ACMI** for complete details).

War Room

To return to the War Room, select the War Room button.

F-16 Pilots

Once you have created a mission in Nellis Command, select the F-16 Pilots button to finish preparations for takeoff.

Creating or editing a mission

At Nellis AFB, the actual Red Flag training is similar to a mini-campaign: squadrons are selected as either Red Team or Blue Team and they conduct a simulated war over a number of days. Our version of Nellis/Red Flag has been designed as more of a scenario editor and training ground rather than a small campaign.

The procedure for creating or editing a mission is very similar to setting up a mission in the Campaign area. If you are familiar with playing a campaign, you will already know most of what you need to know to create a mission in Red Flag.

Before you begin

Missions you create in Red Flag can cover a variety of scenarios. You have the option to include different allied and enemy aircraft, as well as allied and enemy ground units such as SAMs, AAA batteries, tanks, infantry, artillery and transportation units. You by no means need all these elements to create an exciting mission. Simply pick and choose the items you want. The only item necessary is at least one F-16, and we give that to you automatically.

Who you are

The most important thing to remember is that the plane *you* will fly is Aircraft #1 of Flight #1. Flight #1 has already been created with one F-16 as the leader of that flight. Remember that you are not only the Squadron Commander but also a pilot.

When you choose a pilot for Aircraft #1 of Flight #1, *you* become that pilot. His ability scores will be affected by your actions because you are assuming his identity. If you are successful in combat, that pilot's ability scores will increase; if you fail, his scores may decrease. The skills of computer-controlled pilots may also change, depending on mission success. More information on a pilot's ability scores can be found in **Section V: Squadron Ready Room**.

Red Flag areas

All Red Flag screens have three distinct areas: the map, the map controls and the button panel. Press ⌈Tab⌋ to cycle through the three areas.

The map

This map of Nellis AFB in Nevada shows the placement of all runways, permanent SAM sites, bull's-eye targets, bunkers and other buildings. This is where you will create flights and edit their waypoints.

Icons: The map of the Red Flag range in Nevada shows the topography of the area along with map icons. The red icons indicate target sites; the two blue icons mark the position of Nellis AFB and the city of Las Vegas. In addition to the fixed map icons, waypoint indicators

connected by lines represent the assigned routes of all aircraft and ground vehicles taking part in the exercise.

Waypoints: Waypoints have two functions. They represent both the turning points in the flight route and the point where an aircraft will switch to a new mode of action. Each waypoint has its own action associated with it. Some actions, such as ESCORT and INTERCEPT, are performed *between* waypoints (and begin after you pass the *previous* waypoint). Others, such as BOMB and LAND, are performed at the waypoint itself. You can assign up to eight waypoints in a route.

The waypoints determine the path for all the computer-controlled aircraft except the wingmen in your flight, who will follow your lead. Whenever you engage the autopilot, however, your plane will head toward the next waypoint and switch to the assigned action mode for that waypoint.

Ground unit routes have only a beginning and an ending waypoint. The ground forces will travel from one point to the other and engage any enemy forces they encounter.

To move a waypoint, place the pointer over the waypoint icon, press the left mouse button or the [Shift] key on the left side of the keyboard, and drag it to the position you want with the mouse or arrow keys. If you drag it close to a map icon, it will snap to that location. This will ensure that computer-controlled planes will be able to find a particular target.

When an individual waypoint is selected, you will be able to edit all the information for that waypoint in the button panel.

To scroll the map, click and hold the right mouse button or the [Shift] key on the right side of the keyboard and then drag the zoom box with the mouse or arrow keys.

The map controls

The row of buttons below the map allows you to manipulate the map features.

Time: This display always reads "DAY 000" because the Red Flag exercises at Nellis AFB are continuously running.

Tact/Strat: This button has six positions that are used for displaying information on the map. Three of the positions are tactical, and three of them are strategic. All tactical positions will show your home airfield and the mission target, while all strategic positions will show all friendly and enemy occupied key areas. Tact 1 shows grid and scale, Tact 2 shows grid only, Tact 3 doesn't show grid or scale, Strat 1 shows grid and scale, Strat 2 shows grid only, and Strat 3 doesn't show grid or scale.

Route: This button gives you the option to display either one or all of the air or ground paths on the map. Use the Route button together with the Air and Ground button to filter the number of paths displayed on your map.

Air: This button displays or hides any air routes on the map. If Route is set to All, you will see all the air routes that have been created. You can limit the display to only one air route by selecting the one you want to see and toggling the Route button until it says One. Only the route you have selected will be displayed on the map. This is useful to eliminate the clutter of multiple routes.

Ground: This button displays or hides any ground paths on the map. It works identically to the Air button, but controls ground unit paths instead of aircraft flight routes. Use it in conjunction with the Route button to limit which ground paths are displayed on the map.

Zoom: The Zoom button (or the ⊞ and ⊟ keys) allows you to change the magnification of your map so that you can plot waypoints more precisely. You will zoom in or out on the rectangle-shaped area that surrounds the cross hairs. It magnifies your view in the following increments: 1x, 3x, 8x and 20x. After 20x, the view changes to an aerial view of the 3-D landscape. You can continue to zoom in to 50x, 120x and 250x.

When you reach 250x, you can slowly increase magnification all the way to 999x. The more you increase your view, the lower the angle of viewing becomes.

By using the same controls as in moving the map, you can move around and see different parts of the map in 3-D perspective.

The button panel

The button panel at the right of the screen represents the main menu on all Red Flag screens. Buttons with arrows will change screens. The bottom-most button on each screen will take you to the next screen, while the second button from the bottom will return you to the previous screen.

The half-size buttons with LED displays cycle through a series of options with the mouse buttons or ⟨Shift⟩ keys (e.g., the Formation button) or let you enter a number from the keyboard (e.g., the Altitude button).

If a button has diagonal gray stripes across it, that button is disabled.

The button panel video screen

Above many of the button panels a small video screen will appear containing a list of information. To select items from the list, either highlight the item directly with the pointer or scroll the list with the scroll arrows located to the right of the screen.

Nellis Command

From the Nellis Command screen, you can edit the details of your mission. You can assign aircraft and ground forces to both teams. You can also review 3-D models, photographs and specifications for every air and ground vehicle in the game by selecting the Report button.

Enemy/Allied Aircraft

The Enemy Aircraft and Allied Aircraft sections of Red Flag allow you to choose and position different types of enemy or allied aircraft and set up their flight routes. You can also give the aircraft a variety of weapons (or none at all!).

There are three identical screens dedicated to aircraft mission planning for each side. The Aircraft screens allow you to create the separate flights involved in the mission. The Waypoint screens let you plot the flight route, speed, altitude and actions for each flight of aircraft. The Setup screens allow you to select the type of ordnance the non-F-16s in the mission will carry. The F-16s in the mission will be manned and armed just prior to takeoff in the F-16 Pilots and F-16 Armament screens.

Note that you will always have at least one allied flight with your own F-16 as flight leader.

Enemy/Allied Aircraft screen

The Allied and Enemy Aircraft screens allow you to create the basic aircraft flights for both sides. You can add or delete both flights and individual aircraft as well as assign flight formations. Although you have a maximum of eight enemy and eight allied aircraft to place for each mission, you can only have six different types of aircraft other than the F-16. Therefore, you can only have three types of enemy aircraft and three types of allied aircraft or any such combination for a total of six aircraft types. You may create up to four flights for each side within these aircraft constraints (i.e., one allied flight with eight aircraft, four allied flights with two aircraft, etc.).
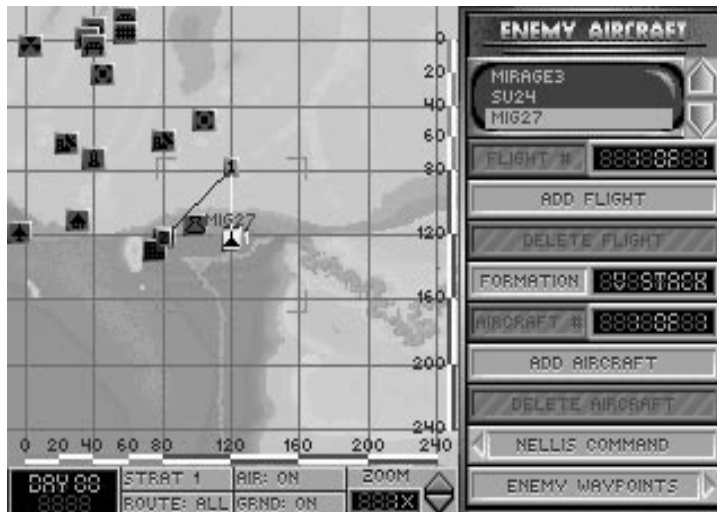
Aircraft List: In the small video screen at the top of the button panel, a list of available aircraft is displayed. When you want to add a plane to one of your flights, highlight a plane from this list using the scroll arrows to the right of the aircraft list and then select the Add Aircraft button.

Flight #: This button cycles through the existing flights of aircraft.

Add Flight: This button adds a new flight route with one aircraft of the type highlighted in the aircraft list. A standard flight route with a starting point and two waypoints will be added to the map display. You may find it helpful to roughly position these points near their final position before continuing to the next screen or adding more flights.

Delete Flight: This button will delete the current flight with all its waypoints and aircraft.

Formation: This button allows you to change the formation of the current flight of aircraft. The possible formations are V STACK, H STACK, C STACK, LADDER, WEDGE, VIC and ECHELON.

Aircraft #: This button displays the current aircraft by number within the current flight. This number corresponds to the aircraft's position in the list displayed on the map (next to the starting waypoint of its flight). Select the button to cycle through the aircraft in the current flight.

Add Aircraft: This will add one aircraft to the currently selected flight of the type highlighted in the aircraft list. The aircraft's name will appear on the map next to the initial waypoint of that flight.

Delete Aircraft: This will delete the aircraft displayed on the Aircraft # button LED from the currently selected flight. Important note: you will not be able to delete Allied Aircraft #1 from Flight #1 because this is your own F-16.

Nellis Command: Select this button to return to the Nellis Command screen. If you have not set up waypoints, you may wish to do so first since newly created flights will only fly to the first waypoint and return without taking any other action.

Enemy/Allied Waypoints: Select this button to continue to the next mission planning screen, where you may assign specific routes and actions to each flight.

Enemy/Allied Waypoints screen

Now that you have your aircraft and flights set up, you can use this screen to edit the actions and waypoints of each flight. Each flight has a maximum of eight waypoints. Note that individual aircraft on a flight cannot have different actions at a single waypoint.
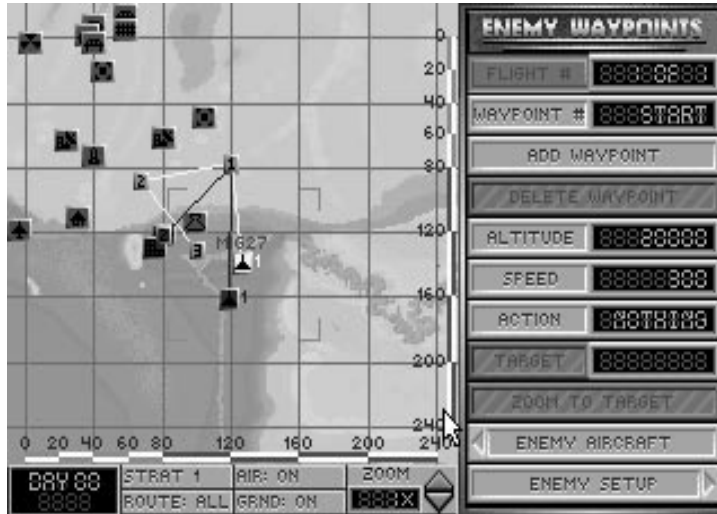
Flight #: This button cycles through the existing flights of aircraft.

Waypoint #: This button cycles through the existing waypoints of the current flight. The information displayed by the Altitude, Speed and Action buttons pertains to this waypoint.

Add Waypoint: This button adds a new waypoint after the current waypoint.

Delete Waypoint: This button deletes the currently selected waypoint from the flight you are working on.

Altitude: After selecting this button, type in a number (from 0–70000) to set the altitude *above ground level* (AGL) at which the flight will approach the waypoint.

Speed: After selecting this button, type in a number (from 160–1350) to set the speed (in knots) at which the flight will approach the waypoint. Unless they encounter hostile forces, the flight will maintain this speed at the set altitude once they pass the previous waypoint. Remember, however, that the top speed of some aircraft is limited. Check the Report screen for more information on aircraft specifications.

Action: This button allows you to assign a particular action that the flight will perform as it approaches the waypoint. You may need to give the aircraft time to prepare for an upcoming action. Once the flight passes this waypoint, the aircraft will switch to the action mode of their next waypoint.

As it flies along this path, the flight will INTERCEPT enemy aircraft between Start and waypoint 1, look for ground forces to destroy (CAS) between waypoint 1 and waypoint 2, and will prepare to BOMB the target at waypoint 3 as soon as it passes waypoint 2.

The possible actions are:

NOTHING: The flight will take no action. It will simply continue on to the next waypoint. Aircraft on the flight will defend themselves if attacked, but they will not actively search for enemy aircraft or ground units.

CAP: Combat Air Patrol. The flight will seek to protect the area along their flight route from enemy aircraft. Aircraft will not attempt to locate or destroy any unfriendly ground units they encounter, nor will they stray very far from their assigned flight route to chase enemy planes. You can use a string of CAP waypoints to make your aircraft circle an area (see LOITER). Use this action to provide air cover over a localized area. Use INTER-CEPT for wider coverage.

CAS: Close Air Support. The flight will actively search for unfriendly ground units to destroy. Aircraft will not attempt to locate or destroy enemy aircraft. Since the aircraft in the flight will need time to select A-G weapons and acquire targets, any CAS waypoint should be placed at least seven miles from the previous waypoint.

S AND D: Search and Destroy. This option combines the functions of CAP and CAS. The flight will engage and destroy all unfriendly aircraft and ground units it can find.

BOMB: The flight will bomb the target chosen with the Target button (described later). Since all planes in a flight will bomb the same target, you should set up a flight for each target to destroy multiple targets at one site. If the waypoint is not near a target site, no target can be selected and the flight will drop their bombs on the dirt. Computer-controlled planes will only make one pass at the target. The aircraft in the flight may need up to 15 miles to select weapons and acquire their target for this action.

INTERCEPT: The flight will engage and seek to destroy all enemy aircraft they detect. Use this action for a wide area defense and for aggressive patrols. Do not use INTERCEPT to defend a localized area, because the flight may wander far from their assigned flight route to pursue hostile aircraft, leaving the area undefended. To defend a small area, use CAP instead.

LOITER: This action is used in conjunction with CAP to set up a continuous patrol.

Normally after passing a CAP waypoint, the flight will continue on to the next waypoint. Using LOITER, however, you can instruct the flight to repeat a string of CAP waypoints until they run low on fuel. To do this, create a number of consecutive CAP waypoints around the area you want the flight to patrol. After the last CAP waypoint, create a LOITER waypoint. When the flight reaches the LOITER waypoint, the pilots will calculate the fuel needed to redo the circuit. If they have enough, they will continue the patrol; otherwise they will return to base. Note that the flight will only repeat a consecutive string of CAP waypoints immediately preceding the LOITER waypoint. If a waypoint of another action separates the CAP and LOITER waypoints, any CAP waypoints before this other action are not repeated. No waypoints other than CAP can be repeated with LOITER.

ESCORT: The flight will protect a corridor around their assigned flight route from incursion by enemy fighters. They will stay as close as possible to their flight route and will not engage aircraft that do not pose an air-to-air threat to the escorted flight, such as strike aircraft or non-aggressive fighters. To use this action effectively, the speed and flight routes of the escorting flight should match those of the flight it is escorting.

LAND: This should be set only at your home airfield. This action will automatically be set for the last waypoint of the route.

TAKEOFF: The TAKEOFF action will only affect your personal F-16. The action can only be assigned to the start waypoint of your flight route and only when this waypoint is over Nellis AFB. The wingmen in your flight will already be in the air circling the airfield waiting for you to take off. You also have the option of starting a mission already in flight. Simply select a different action for the start waypoint and set your desired altitude and speed. The start waypoint for all other flights should be given an appropriate altitude and speed to begin the mission in the air.

Target: Selecting this button will cycle through the target frag list and assign the displayed target to the flight. The frag list contains the most significant military targets at the site, in order of importance. The Target button will only be enabled when the Action button displays BOMB. If you move the waypoint away from the site, the target selection will be reset to the top of the list, even if the waypoint is subsequently returned to that site.

Zoom to Target: Click this button to zoom the map display to a 3-D close-up of the assigned target to help you identify your objective when you reach the target site. The zoomed image will rotate, giving you a 360° view of your target, until you click the mouse button or press the [Enter] key.

Enemy/Allied Setup screens

The Enemy/Allied Setup screens are used to customize the *non-F-16* aircraft in the mission. Each aircraft can be fitted with a host of different weapons.

Initially, all planes will have a default weapon load corresponding to their mission. Note that you will individually man and load all F-16s in the mission just prior to takeoff.

Armament: The armament list displayed on the small video screen allows you to customize the weapons load of the currently selected aircraft. If one of the weapons options does not have a circle to the left of it, the plane is unable to carry that type of ordnance. If a circle is solid, that weapons system will be loaded on the aircraft for the mission. If the circle is hollow, the weapons system will not be loaded.

Flight #: This button cycles through the flights of aircraft.

Aircraft #: This button cycles through the aircraft in the current flight.

Enemy/Allied Forces

The Enemy Forces and Allied Forces screens allow you to place ground forces (tanks, AAA, SAMs, infantry, etc.) anywhere on the map. You will get a starting point and ending point for each group (known as a route), and you can move these points to any position.

You can place up to a maximum of 60 units total, which you may divide any way you choose (30 enemy and 30 ally vs. 40 enemy and 20 ally, for example). These ground units will travel from point 1 to point 2 in a straight line, not avoiding any terrain features. In addition, if they encounter unfriendly units in their path, they will stop and shoot it out until one side or the other is destroyed.

Enemy/Allied Forces screen

Since many of the same generic types of forces exist in the Enemy Forces and Allied Forces screens, we can discuss both screens together.
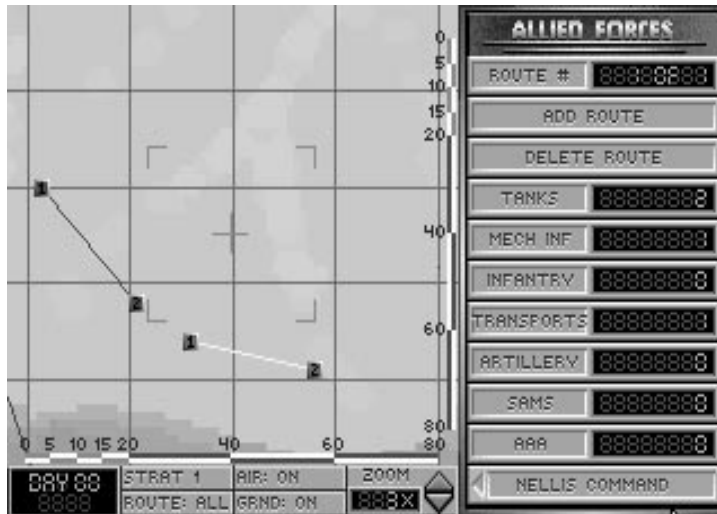
Route #: This button cycles through the existing routes of ground units.

Add Route: This button adds a new route to the map. You can create up to four routes distributed between the two sides. Note that the Route # button will only display routes assigned to the side you are currently working on.

Delete Route: This button deletes the current route from the map.

To set the number of any type of unit in the current route, select the button displaying the type of unit. You can place up to seven of each type in every route, but if the total number of units in the four routes exceeds 60, the number of units actually participating in the mission will be proportionately reduced to 60. The unit types you can use are Tanks, Mechanical Infantry, Infantry, Transports, Artillery, SAMs and AAA. For a description of the vehicles in these units, see the Report screen.

The following vehicles and weapons will be assigned to the indicated side when you select the corresponding button:

	Allied Team	Enemy Team
Tanks	M1 Abrams	T-72
Mech Infantry	M2 Bradley	BMP-1
Infantry	Shoulder-launched SAMs	Shoulder-launched SAMs
Transports	Green Army trucks	Brown Army trucks
Artillery	D-130 122mm howitzer	M198 155mm howitzer
SAMs	Roland	SA-6 Gainful
AAA	M163 Vulcan	ZSU-23-4 Shilka

Report screen

The Report screen allows you to view 3-D models, photographs and specifications for every aircraft and ground vehicle in the game. Use this information to identify enemy and friendly aircraft and ground vehicles, and to learn their capabilities, strengths and weaknesses.

To use the Report Screen, select the button of the type of unit you wish to view. The screen will change to display the mission computer, which holds information on all aircraft and ground vehicles for both sides.

The mission computer displays the specifications for the current vehicle or aircraft, a photograph and a rotating 3-D model.

View: The view buttons will cycle the display through the list of aircraft or vehicles you selected when you engaged the mission computer. Use the mouse or the ← and → keys to operate the View buttons.

Scroll text: The scroll text buttons move the text up and down on the screen. Use the mouse or the ↑ and ↓ keys to operate the Scroll Text buttons.

Exit: To return to the Report Screen menu, click on the Exit button or press Esc.

Done

After setting up the allied and enemy aircraft and ground forces you want for your mission, you are ready to fly it. Select Done to return to the Red Flag screen. Then select the F-16 Pilots button to begin final mission preparations.

F-16 Pilots screen

At the F-16 Pilots screen, you select particular pilots to fly the F-16s in a mission. You can run any mission several times using different pilots and weapons, if you wish. Because Red Flag is designed as a training area, you may want to train the least experienced pilots in your squadron. Sending them through missions in Red Flag will give them invaluable experience for a campaign.

As with the rest of Red Flag, you do not have to make adjustments on these screens. However, if you want to train specific pilots to gain proficiency with a particular type of ordnance, you will want to make some minor changes to the default setup of the F-16 Pilots and F-16 Armament screens.

All the F-16s in the mission will be displayed on the left side of the screen, with default pilots from your squadron assigned. If you have assigned non-F-16 aircraft to fly as wingmen in any of your flights, they will not be displayed. You can only assign pilots to the F-16s; other aircraft will have their own pilots.

When flying around during your Red Flag mission, you may receive radio messages on the top of the screen from other aircraft in your flight. You can recognize the F-16 pilots from your squadron by their callsigns. Non-F-16s will be identified by their aircraft type (A-10 #1, C-130 #3, etc.). An explanation of these radio messages can be found in **Section IX: Flight**.

Pilot roster: The pilot roster is displayed on the small video screen on the right. This is a list of all the F-16 pilots in your squadron. To assign a pilot to an aircraft, simply highlight a name on the list with the scroll arrows and then select the F-16 you want them to fly. The pilot initially assigned to that aircraft will be returned to the roster.

Flight #: This button cycles through the allied flights of F-16s.

Pilot Information: This button takes you to the Pilot Information screen where you can view pilots in your squadron.

Pilot Information screen

The Pilot Information screen allows you to view individual pilots in your squadron. The left side of the screen contains important information about the pilot such as the number of sorties (missions) flown, the number of enemy aircraft shot down, the number of ground targets destroyed, and any medals and commendations that have been awarded. In addition, you can view the pilot's face, name, rank and callsign. (A complete explanation of pilot abilities can be found in **Section V: Squadron Ready Room**.)

In Red Flag, you can use this screen to determine who is best suited for your mission. For example, if you were conducting a bombing exercise, you would look for a pilot who is particularly skilled in Bombing Accuracy and Flying Ability to accompany you on your bomb run. In Red Flag, however, you may not always want the most skilled pilot to fly a specific exercise. The intent here is to train the less skilled pilots so that they can become better. Increased ability scores come from repeated training.

Pilot roster: To view the statistics of a particular pilot, highlight the pilot's name on the small video screen.

Name: To change a pilot's name, select this button and type in the new name. The new name can have up to 12 letters.

Callsign: Use this button to change a pilot's callsign. The new callsign can have up to 15 letters. Any radio messages you receive from a pilot will use the callsign, rather than the name.

Change Face: Use this button to cycle through the available faces for your pilot.

Awards: Select this button to display the awards a pilot has received instead of the pilot information. Awards are given to recognize excellent performances in combat. To redisplay the pilot information, select the Information button (which has replaced the Awards button in the menu).

Done: Select this button to return to the F-16 Pilots screen.

F-16 Armament: When you are satisfied with your pilot assignments, select this button to advance to the F-16 Armament screen, the last step before takeoff.

F-16 Armament screen

This screen allows you to customize the weapons load of any F-16 in the mission. Initially each aircraft will not have any weapons loaded on board, so you must load the weapons you wish to carry for the mission.

Loading Armament: The left side of the screen shows a picture of an F-16, a number of buttons and a weapons display. The F-16 has four pylons or "hard points" per wing as well as a centerline mount on which weapons and other stores can be loaded. Note that the heavier weapons and stores can only be loaded on the inner pylons. These items will also be both loaded and dropped in tandem to maintain the aircraft's balance during flight. The M61A1 20mm cannon is mounted internally and is always loaded with 515 rounds.

To load a weapon or another type of store, first select the category of weapon with the buttons on the bottom of the screen. Then select the Load button. You may also click directly on a weapon or store on the F-16 to bring up its selection in the weapons display window. You have a choice of A-A Missiles, A-G Missiles, A-G Bombs and Other Stores.

A-A Missiles:

You can load three different air-to-air missiles: the AIM-9P Sidewinder, the AIM-9M Sidewinder and the AIM-120 AMRAAM.

AIM-9P and -9M: The Sidewinders are heat-seeking missiles. The AIM-9P is a rear-aspect missile with an effective range of approximately 10 miles. The AIM-9M is an all-aspect missile with an effective range of 10 miles. The rear-aspect AIM-9P requires that you be behind an enemy aircraft in order to get a good lock. The all-aspect AIM-9M can lock on to an aircraft from any angle or aspect.

AIM-120: The AMRAAM is an active-homing radar-guided missile which has an effective range of approximately 25 miles and is designed for use beyond visual range (BVR). The problem with carrying AMRAAMs is that each one of them weighs nearly twice as much as a Sidewinder. This affects your aircraft's maximum Gs and drag, which are major factors in air-to-air combat.

A-G Missiles:

The F-16 can carry four types of air-to-ground missiles and one rocket launcher: the AGM-65B and -65D Mavericks, the AGM-45A Shrike, the AGM-88A HARM and the LAU-5003A rocket launcher.

AGM-65B and -65D: The difference between the AGM-65B and -65D is that the -65B is optically-guided while the -65D is infrared-guided. The -65B is much more effective in the daytime, while the -65D can be used at night. Both Mavericks are effective against tanks, trains and other small targets. These two weapons have an effective range of approximately 14 miles.

AGM-45A: The Shrike anti-radiation missile is designed to take out SAM sites and radar installations. It has an effective range of approximately 12 miles.

AGM-88A: The HARM anti-radiation missile is similar to the Shrike. The HARM has over twice the range and weighs twice as much as the Shrike. The effective range of the HARM is approximately 30 miles.

LAU 5003A: This rocket launcher contains 19 small rockets which are fired individually. It has an effective range of approximately 3–4 miles and is primarily used for CAS on "soft targets" such as trucks, jeeps and infantry.

A-G Bombs:

The F-16 carries seven different types of bombs: the Mk82, the Mk82HD, the Mk83, the Mk84, the Durandal, the CBU-84 and the optically-guided GBU-15.

Mk82, Mk83 and Mk84: These weapons are standard iron bombs that have been used in one form or another for the past 20 years. The differences between them are the munitions load (500, 1,000 and 2,000 pounds respectively) and the corresponding weight. Base your choice of iron bombs on the size and "hardness" of the target.

Mk82HD: The Mk82HD (High Drag) bomb should be used instead of the other iron bombs for low altitude drops so that the bombs will decelerate sharply and explode behind, rather than underneath, your plane. It otherwise contains the same munitions load as the Mk82.

Durandal: The Durandal (also known as the BLU-107/B) is only used for destroying runways. Upon impact, the Durandal will plow under the surface of the runway and explode outward. This will buckle the runway and create a sub-surface cavity much more difficult to repair than a normal bomb crater.

CBU-84: The CBU-84 releases a cluster of 202 bomblets that disperse over a wide area. Use this weapon to defeat infantry and other soft targets such as trucks, jeeps and light armor.

GBU-15: The GBU-15 is a precise, optically-guided bomb that is used to destroy large targets like buildings, nuclear power plants and factories. It can also be used to destroy hardened structures such as command bunkers and aircraft shelters. It operates much like a Maverick missile, but has an effective range of approximately five miles.

Other Stores:

In addition to any weapon systems you may load, you also have the option of equipping your F-16 with external fuel tanks or an ALQ-131 ECM pod.

External fuel tanks: You have your choice of two different fuel tanks — a 300-gallon tank that is loaded under the belly of your plane or two 370-gallon tanks that are loaded on the wings. Depending on the target distance of your mission, you may want to choose one or the other of these options. Remember, however, that adding additional fuel tanks will severely hamper your maneuverability.

ALQ-131 ECM pod: The ALQ-131 is an electronic countermeasures device designed to defeat radar lock-on from SAMs on the ground. It is primarily used on air-to-ground missions but is moderately effective against enemy aircraft radar lock-on. However, there is a catch. Turning on your ECM pod broadcasts your position to every enemy aircraft in the area. Since the ECM pod can only be mounted on the aircraft centerline, it cannot be loaded with the 300-gallon fuel tank in place.

To add or subtract stores from your aircraft, choose a weapon in the selected category with the scroll arrows to the left of the weapons display, then simply select either the Load or Unload buttons just below the F-16 picture. The number of weapons loaded and the total number of weapons in stock are just to the right of the Load/Unload buttons. The # Loaded display will tell you how many units of a weapon are currently loaded and how many more could be loaded.

Flight #: This button cycles through the flights of allied aircraft.

F-16: This button cycles through the aircraft in the current flight. The leader of the flight will be indicated in this button by the term LEADER. Wingmen will be indicated by the term 1st WING, 2nd WING, etc.

Clear All Weapons: This will remove all weapons and other stores from the current F-16.

Default Load: Select this button if you wish to cancel any changes you have made and restore the default load which the computer assigned for your mission.

Copy Leader: The Report button will change to Copy Leader when you switch to one of your wingmen and begin to load weapons. Press the Copy Leader button to automatically load the current aircraft with the same weapons as the leader.

Aircraft Information: The screen in the lower right-hand corner displays the current F-16's loading information — its takeoff weight, the maximum Gs it can pull (with the current weight) and the amount of drag affecting the F-16. The higher the drag factor, the more "resistance to flight" the plane will have. Drag is based on the shape and weight of the armament loaded. Determining the best configuration for your aircraft is a balancing act between firepower, maneuverability and range. The success of many missions may be determined by your decisions here.

Takeoff: Select the Takeoff button to begin the mission. Refer to **Section IX: Flight** for detailed instructions on flying and using weapons.

"Life after death"

The "life after death" feature allows you to view the action in a mission even if the plane you're flying has been destroyed. If your plane crashes into the ground or you're wiped out by a missile, the mission will not immediately end. A dialog box will inform you of your death and ask if you wish to watch the rest of the mission from your wingmen's point of view (if you have any on the mission).

You can now see the action from any of your wingmen on the flight by pressing ⑦ to change your view from one wingman to the next. If you want to look at a different target from the wingman's view, press Ⓣ. If all your wingmen are destroyed or the mission is completed, the mission will end. Otherwise, you can end the mission by selecting End Mission from the FILE menu.

CAMPAIGN

Campaign introduction

The campaign is the core of *Falcon 3.0.* Here, you take the part of a squadron commander in one of three theaters of conflict: Israel, Kuwait or Panama. The outcome of each campaign may very well be determined by your performance on the battlefield. The Central Command of each theater will map out allied strategy for the war and send an Air Tasking Order (ATO) to your air wing. During the war you will be given a variety of different missions, ranging from simple aerial patrols to cutting off enemy supply routes to multiple-aircraft surgical strikes deep into enemy airspace.

Under your command are 30 pilots, each with his or her own strengths and weaknesses. As Squadron Commander, it is your job to manage your men and equipment as best you can. The war will require a grueling schedule of four missions a day, and your pilots will get tired. Aircraft and supplies will not always be plentiful, so you will have to budget the equipment and stores for future missions. Initially you have 18 working F-16s assigned to your squadron, but this number will inevitably drop during the course of the war. Your job as commander is not simply a desk job — you will *lead* your men into battle as well.

You will plot each flight's route in and out of the target area. Since you have a limited amount of armament and because planes can be damaged or destroyed in combat, you need to keep track of current and forthcoming supplies.

Every so often, you will receive a number of new pilots, F-16s and armament. The day the armament comes in, you may be assigned to escort the C-130 cargo planes to your home airfield. If those C-130s don't make it, you won't receive your supplies and you will have to wait until the next supply date.

You will have specific objectives to accomplish in order to attain victory, but there is no certain path to achieve these goals. Wars are fluid, and the race is not always to the swift, the battle not always to the strong. Still, the victor is likely to be the one who can seize fortune and turn it to his advantage. In *Falcon 3.0,* there is no fixed set of missions which you must successfully complete to achieve victory. Central Command creates missions based on the ever-changing war situation. The White House determines the campaign objectives based on both political and military considerations, and will define your conditions for victory on the War Update screen when you first enter a campaign.

The campaign may seem daunting, but you are not alone. You will fly many missions in conjunction with other aircraft and ground forces. You will be called upon to act in both offensive and defensive roles. You will escort other planes on their way to the target. You will provide air cover and close air support for ground operations. Since even the F-16 flies like a cow when loaded with heavy ordnance, you will need fighter escort for your bombing missions and perhaps SAM suppression as well.

The campaign will continue to progress in the background, with sorties and skirmishes going on, even when you are on the ground.

Starting a campaign

To begin a campaign, enter the War Room, select a squadron to command, choose a theater in which to fight, and then commit your squadron to action.

Choose a squadron

Before you can enter one of the three theaters, you must choose a squadron to command. In the War Room, choose a squadron by clicking in the center of the rightmost monitor in the War Room. Each time you click on this monitor, you will cycle through the existing squadrons.

For more information on squadron selection and editing, see **Section IV: War Room** (to choose a squadron) and **Section V: Squadron Ready Room** (to edit or view a squadron's information).

Selecting a theater

Now that your squadron is chosen, you must select a theater of operations. *Falcon 3.0* has three theaters: Kuwait, Israel and Panama. In each theater, your squadron will need to accomplish a different objective.

Click on the Theater button in the War Room and watch the map. Each time you select the Theater button, a small box will appear on the area of the map where the theater is located. When you decide on one, you'll need to commit your squadron to that campaign theater.

Commit to a theater

Once you have your theater selected and your squadron is ready to roll, you need to "commit" them to a theater. "Committing" places your squadron in Day 1 of a new campaign. If they were in another campaign at the time, a dialog box will appear asking you if you want to wipe out your squadron's old campaign. If you are continuing a previous campaign, just select your squadron and press the Commit button.

Overview of a campaign

What is a campaign? A campaign is a series of interlinked missions in a specific geographical war zone. Your F-16 squadron is but one offensive weapon in this war — other squadrons of various aircraft are also involved and may assist you by assigning planes to your missions. You may be also called on to provide support for bombers or ground troops. Overall, you will have a variety of missions to complete and the success of each will be a major factor in the campaign.

Campaign objectives

Each campaign has a specific objective that you must accomplish to win the war. At the beginning of each campaign, the War Update screen will explain how to win the campaign in this theater.

War Update screen

The War Update screen will also appear just before the first mission of the day and give you a briefing of the prior day's events. In addition, at the beginning of the campaign, the War Update screen will give you a detailed description of the theater's objectives and how you should go about accomplishing them.

Campaign Information screen

At the beginning of each mission, you will be presented with a status screen showing the current date, time, weather forecast and a host of other items.

Mission Planning screens

Following the Campaign Information screen will be a series of screens where you can plot out your mission. Here, you can add or subtract planes from the mission, change the flight route in and out of the target area, assign pilots to planes, and load weapons on those aircraft.

Flying the mission

Once you select the Takeoff button on the last Mission Planning screen, you'll be placed in your aircraft on the runway. From here you can follow your prescribed flight route in and out of the target area and then return to base. Any wingmen you have will automatically follow your aircraft.

Debriefing screens

After your mission is over — whether you fail or succeed — you will be presented with a debriefing sequence. Debriefing will show all the relevant statistics of your current mission and allow you to view your squadron's records. In addition, medals will be awarded here if any of your pilots have earned them.

Summary

All of these stages comprise a campaign. Campaign Information, Mission Planning, Flying the mission, and Debriefing will be repeated up to four times a day for as long as the campaign lasts. Whether you have won or lost, you can then *lead* your surviving pilots into combat in a new theater.

Who you are

The most important thing to remember is that the plane you will actually fly on a mission in a campaign is F-16 #1 of Flight #1. In each mission, Flight #1 has been already created with one F-16 as the leader of that flight. You are not only the Squadron Commander, but you're also a pilot.

When you choose a pilot for F-16 #1 of Flight #1, you become that pilot. His ability scores are no longer valid for that mission because you are assuming his identity. If you are successful in combat, that pilot's ability scores will increase; if you fail, his scores may decrease. In addition, computer-controlled pilots will increase and decrease their skill levels based on their successes or failures. More information on a pilot's ability scores can be found in **Section V: Squadron Ready Room**.

The Enemy

As a military commander, your primary objective is to destroy the enemy's war fighting potential. While the enemy forces will vary from theater to theater, they will always contain the following components:

Ground Forces

Consisting primarily of armor, infantry and artillery, with support from transportation and anti-aircraft defense units, the army is always the core of any war fighting machine. Its effectiveness, however, is strongly influenced by the other components. You will be targeting enemy troops in three situations. When friendly ground forces come under assault, they may request air power to blunt the enemy attack. They will also request close air support for offensive maneuvers if the battalion commander believes that his own firepower is insufficient for the task. Finally, you may be assigned to interdict the enemy's second echelon forces before they can reach the battlefield.

Air Power

Unhampered, air power can have a devastating effect on opposing ground forces. Gaining air superiority is essential to a successful war effort. At minimum, you must deny it to the enemy. Achieving air superiority will require suppressing all parts of the enemy's air power complex, including runways, hangars, command centers and radar installations, as well as destroying the enemy aircraft themselves.

Command, Control and Coordination (C^3)

Operation Desert Storm demonstrated both sides of the C^3 equation. The Coalition had excellent C^3; Iraq had none by the time the ground war started. Destroying the enemy's C^3 structure will require a systematic and persistent campaign of bombing strikes against headquarters, command centers, and radar and communication facilities.

Logistics

Every army runs on its stomach. A logistics system has three main components that can be attacked and destroyed. First, is the production capacity of war materials by the enemy's industrial complex. Military targets will include weapons and munitions factories, machine factories, oil and chemical refineries, and any chemical, biological or nuclear weapon research and production facilities the enemy may possess. Second, the enemy will have a

reserve supply of war materials when the campaign starts. These stockpiles, held in warehouses, railyards, and Petroleum, Oil, and Lubricants (POL) and chemical storage tanks, might actually represent a more important target initially than the production facilities themselves. Finally, the supplies must be transported. Supply route targets include bridges, railroad trestles and the transport vehicles (cargo planes, trains and trucks).

The relative importance and vulnerability of these components will vary in each campaign for both sides. Political as well as military considerations can make some assets unassailable. In Kuwait, for example, most of the Coalition logistics system is too well defended for the Iraqi air force to attack. Only the forward supply depots and transportation vehicles are at risk. At the same time, most of Iraq is within range of your F-16. In Panama, the rules of engagement preclude attacks on the home countries of the enemy forces, so only assets near the battle can be attacked. In Israel, the situation is fairly balanced.

While Central Command determines overall strategy, you still must make important decisions within this framework. In choosing targets, always remember the Golden Rule: Whatever you are trying to do to the enemy, he will be trying to do to you.

War Update screen

The War Update screen displays the morning's military news. This news report will give you a feel for what is happening in the war. Remember that your F-16 squadron is not the only unit operating in the theater. You will find out the results of other war actions here. This screen is shown immediately before your first mission in a campaign and at the beginning of each day.

Before a campaign

Just before your first mission in a campaign, the War Update screen will provide information on your campaign's objectives and what steps you need to take in order to win the war. Your F-16 squadron is a pivotal instrument in each campaign; if you make constant mistakes during the course of your missions, the tide of the war will most surely turn against you.

Before each day

In addition, before your first mission of each day, you will be presented with an update on what happened in the war the previous day. You will be told how your squadron fared in its mission as well as what other squadrons and land-based units managed to accomplish.

Campaign Information screen

Each campaign can last from 7–14 days and your squadron must undertake four missions a day during that time. The Campaign Information screen gives you the following logistical information along with a current weather report:

Current Date

This displays the date and time of your upcoming mission. You will fly in *Falcon 3.0* at four different times: early morning, mid-morning to afternoon, evening and night. All times are displayed in standard military time format.

Available Aircraft

This line shows the number of airworthy F-16s you have assigned to your squadron. You will start out with 18 F-16s, but during the course of the war some may be damaged or lost.

Available Pilots

This line displays the number of pilots you have remaining in your squadron. You begin with 30, but if any are lost in combat, this number will diminish.

Current Weather

This tells you the current weather conditions. It will also let you know of a cloud ceiling (if any) and its elevation. If the current weather forecast is listed as "Overcast," the weather will most likely be overcast on your next mission. You might notice a thick overcast when flying, varying in thickness and altitude.

Tomorrow's Forecast

Similar to the Current Weather line, this is the prediction for the next day's weather. It isn't 100% accurate, however, so you may need have a contingency plan if the weather ends up being rough.

Resupply Date

The Resupply Date lets you know when you will be resupplied with weapons, fuel and other stores. One of the important missions on the resupply day is to escort your cargo planes to your home base.

Replacement Date

The Replacement Date tells you when new pilots and replacement F-16s are due to arrive at your home base. Usually, every few days, you will get some new pilots and planes to replace any lost in the war. Don't rely on this, though, since aircraft are in short supply and you might not receive any for a long stretch of time.

Mission Planning screens

The tools for Mission Planning consist of a number of screens where you can choose and edit your current mission. You can modify nearly every aspect of your mission on these screens. You make the following decisions: the number of F-16s to fly, the formation type, the route in and out of the target area, which pilots are going to fly, and what the ordnance loads will be on each F-16. If you already familiar with Red Flag mission planning, you will notice a few differences here. Your missions will be assigned; you will only control the flight paths of your own squadron, and some of the four allied flights may be allocated to other squadrons. You also have access to intelligence and reconnaissance tools not available in Red Flag. You must fight with limited equipment and stockpiles. Finally, your pilots can actually die in a campaign.

Correct planning is the key to your success on a mission. However, if you are a beginning player and don't want to go into all the complexities of planning a mission, defaults for each screen will be given. All you will need to do to accept the mission defaults is to hit the $\boxed{\text{Enter}}$ key as each screen appears.

Choosing mission parameters

Before you start to plan a mission, you need to understand how Mission Planning works. There are three distinct areas on the Mission Planning screens: the map, the map controls and the button panel. Cycle through the three areas by pressing [Tab].

The map

Icons: The Theater map displays the topography of the region along with markers pertinent to the particular mission planning screens. Red map icons indicate an enemy-held target site; Blue icons mark the position of sites held by the allies. Beginning on the Edit Flights screen, you should see waypoint indicators connected by lines representing the flight paths assigned to your F-16s for the mission. Starting with the Set Waypoints screen, threat circles will be shown on the map as well.

Waypoints: Waypoints have two functions. They represent both the turning points in the flight path and the point where an aircraft will switch to a new mode of action. Each waypoint has its own action associated with it. Some actions, such as ESCORT and INTERCEPT, are performed between waypoints (and start after passing the *previous* waypoint), others, such as TAKEOFF, BOMB and LAND, are performed at the waypoint itself.

The waypoints determine the path for all the computer-controlled aircraft except the wingmen in Flight #1, who will follow your lead. Whenever you engage the autopilot, however, your plane will head toward the next waypoint and switch to the assigned action mode for that waypoint.

To move a waypoint, place the pointer over the waypoint icon, press the left mouse button or the [Shift] key on the left side of the keyboard, and drag the waypoint icon to the position you want with the mouse or arrow keys. If you drag the waypoint icon close to a map icon, it will snap to that location.

When an individual waypoint is selected, you will be able to edit all the information for that waypoint with the button panel.

Threat circles: The threat circles map the range of influence of the major known enemy air-defense installations. The Trace and Recon buttons will give you more detailed information on the types of threats these circles point out.

Moving the map: To scroll the map, hold down either the right mouse button or the [Shift] key on the right side of the keyboard and then drag the zoom box with the mouse or arrow keys to the position you want.

The map controls

The map controls are used to manipulate all the features relating to the map.

Time: This readout displays the time of day for the current mission. All times are displayed in military time.

Tact/Strat: This button has six positions that are used for displaying information on the map. Three of the positions are tactical, and three of them are strategic. All tactical positions will show your home airfield and the mission target, while all strategic positions will show all friendly and enemy occupied key areas. Tact 1 shows grid and scale, Tact 2 shows grid only, Tact 3 doesn't show grid or scale, Strat 1 shows grid and scale, Strat 2 shows grid only and Strat 3 doesn't show grid or scale.

Route: This button gives you the option to display either all flight routes or only the highlighted route.

Trace: Selecting the Trace button will examine the current flight path for enemy threats and activities. The Trace button is available on the Edit Flights and Set Waypoints screens. When you press this button, the computer will begin "tracing" your flight route from your home airfield to each waypoint on your flight. The threats it will display are air-defense radar installations (primary and secondary) and enemy fighter bases. Each threat circle will have a number associated with it which will appear with a threat description on a small video screen to the right of the map. Select the Done button when you are ready to return to the main display.

Recon: The Recon feature gives you an aerial reconnaissance view of the map, showing the last known position of ground forces. This information can be up to a week old. When you select the Recon button, the map will zoom in on the cross hairs and show icons marking the unit positions. Anti-aircraft weapons will have a circle marking their range of fire.

Zoom: The Zoom button (or the ⊞ and ⊟ keys) allows you to change the magnification of your map so that you can plot waypoints more precisely. You will zoom in or out on the rectangle-shaped area that surrounds the cross hairs. It magnifies your view in the following increments: 1x, 3x, 8x and 20x. After 20x, the view changes to an aerial view of the 3-D landscape. You can continue to zoom in to 50x, 120x and 250x.

When you reach 250x, you can slowly increase magnification all the way to 999x. The more you increase your view, the lower the angle of viewing becomes.

By using the same controls as in moving the map, you can move around and see different parts of the map in 3-D perspective.

The button panel

Use the button panel on the right side of the screen to make modifications to your current mission. Buttons with arrows on the left-hand or right-hand side will take you to new screens. The bottom button on any screen will bring you to the next screen, while the second button from the bottom will return you to the previous screen.

The half-size buttons with LED displays allow you to cycle through a series of options with the mouse buttons or [Shift] keys (the Formation button) or to enter a number with the keyboard (the Altitude button).

If a button has diagonal gray stripes across it, that button is disabled.

The button panel video screen

Above many of the button panels, a small video screen will appear containing a list of information. To select items from the list, you can either highlight the item directly with the pointer or scroll the list with the scroll arrows located to the right of the screen.

Report screen

The Report screen gives you a great deal of information about the war, in addition to statistics on aircraft and ground units for allied and enemy forces.

Campaign Status: This button will bring up a screen that displays information about your current campaign including day, time, how much of the conflict area is occupied by allied and enemy forces, missions flown and completed, sorties flown, and a complete breakdown of allied and enemy aircraft and targets destroyed.

Supply Status: This button bring up a screen that shows your total available stores. If stores become scarce, you may need to budget your weapons for upcoming missions.

Allied Aircraft: See Mission Computer below.

Enemy Aircraft: See Mission Computer below.

Allied Forces: See Mission Computer below.

Enemy Forces: See Mission Computer below.

Occupation: This button will bring up the campaign map with areas colored in red and blue. Areas in pure red represent enemy occupation, while areas in blue show allied occupation. When areas in blue and red overlap, you will see a purplish effect. This is the battlefront — areas of major conflict where most of your missions will take place. Keeping track of the changes on this screen over time will give you a good indication of how well the war is going.

Mission computer

The middle buttons on this screen access the mission computer. The mission computer allows you to view 3-D models, photographs and specifications for every aircraft and ground vehicle in the game. You can use this information to identify aircraft and ground units (enemy and friendly) and to learn their capabilities, strengths and weaknesses.

To use the mission computer, select the button of the type of unit you wish to view. The screen will change to display the mission computer, which contains information on all aircraft and ground vehicles for both sides.

The mission computer displays the specifications for the current vehicle or aircraft, a photograph and a rotating 3-D model.

View: The View buttons cycles the display through the list of aircraft or vehicles you selected when you engaged the mission computer. Use the mouse or the ← and → keys to operate the View buttons.

Scroll text: The scroll text buttons move the text up and down on the screen. Use the mouse or the ↑ and ↓ keys to operate the Scroll Text buttons.

Exit: To return to the Report Screen menu, click on the Exit button or press the Esc key.

Done: When you are finished studying the information on the report screen, select Done.

Briefing screen

Missions are sent to your air wing by the Cent Com Air Liaison Officer (ALO). There are three squadrons of F-16s in your wing, but yours gets first choice of missions.

Campaign map

On the left-hand side of the screen is your campaign map. Each mission will show an icon for your home base and an icon for that mission's target. Blue icons represent allied-controlled areas, while red icons represent enemy-owned areas.

The mission briefing can be found just to the right of the map in the video screen. This gives pertinent information about the name of the target area, type of target, characteristics of the mission and any additional planes that may accompany you.

Occasionally, you will be sent on a mission with accompanying aircraft. These extra aircraft will generally be either fighters that are designed to fly Combat Air Patrol (CAP) for you or bombers/transports that you need to protect.

One you have reviewed your mission, press the Edit Flights button to continue to the Edit Flights screen.

Edit Flights screen

The flights and routes for your aircraft will already be set up for the mission, but you can alter them in the Edit Flights screen if you wish. A maximum of eight aircraft arranged in up to four flights can be assigned in each mission. This number includes any flights of aircraft from other squadrons that are also involved in the mission.

If you plan to adjust your flights, we highly recommend keeping aircraft in pairs. In actual combat, a pilot rarely flies solo because there would be no one to cover his back.

In addition, if your mission is to destroy an entire air base (including runway, hangar and tower targets), you may want to break up into multiple flights so each flight can attack a specific target at the destination. See the Set Waypoints screen for more information.
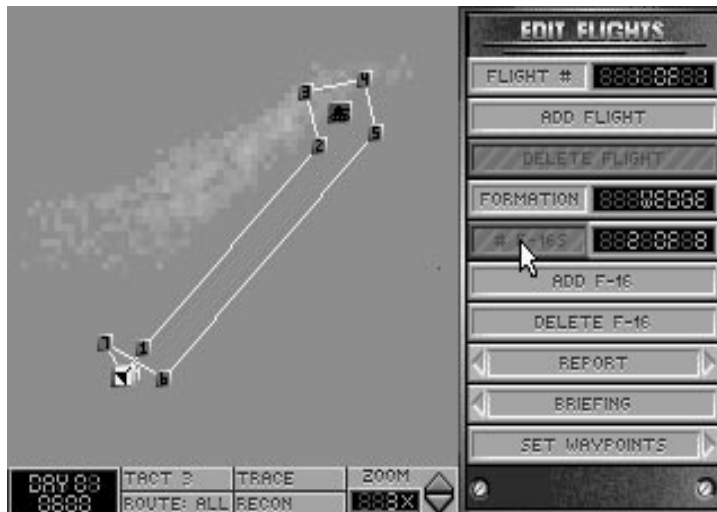
Flight #: This button cycles through the existing flights of aircraft.

Add Flight: This button adds a new flight path with one aircraft. If this button is shaded, it means that you have either already assigned all the aircraft available for the mission or there are already four flights created.

Delete Flight: This button will delete the current flight of aircraft.

Formation: This button allows you to change the formation of the current flight of aircraft. The possible formations are: V STACK, H STACK, C STACK, LADDER, WEDGE, VIC and ECHELON.

# of F-16s: This button allows you to increase and decrease the number of F-16s on the current flight. The LED displays the number of aircraft assigned to the current flight along with the maximum number of planes that could be assigned to the flight. You may have a maximum of eight F-16s per flight.

Add/Delete F-16s: These buttons will add or subtract aircraft from the current flight.

Once you have made any changes to your flight, select the Set Waypoints button.

Set Waypoints screen

The waypoints for the mission have already been set up, but you can alter them if you wish. Remember, however, that the flights of other non-Falcon aircraft in the mission will not alter their flight plans to accommodate you. You may want to alter your waypoints if, based on the Trace and Recon buttons, you determine that the threats are too great on the current waypoint settings.

Each flight has a maximum of eight waypoints. Note that individual aircraft in a flight cannot have individual actions at a single waypoint.

Flight #: This button cycles through the existing flights of aircraft.

Waypoint #: This button cycles through the existing waypoints of the current flight. The information displayed by the Altitude, Speed and Action buttons will correspond to this waypoint.

Add Waypoint: This button adds a new waypoint after the current waypoint.

Delete Waypoint: This deletes the current waypoint from the flight you are working on.

Altitude: After selecting this button, type in a number (from 0–70000) to set the altitude *above ground level* (AGL) at which the flight will approach the waypoint.

Speed: After selecting this button, type in a number (from 160–1350) to set the speed (in knots) at which the flight will approach the waypoint. Unless they encounter hostile forces, the flight will maintain this speed at the set altitude once they pass the previous waypoint. Remember, however, that the top speed of some aircraft is limited. Check the Report screen for more information on aircraft specifications.

Action: This button allows you to assign a particular action that the flight will perform as it approaches the waypoint. You may need to give the aircraft time to prepare for an upcoming action. Once the flight passes this waypoint, the aircraft will switch to the action mode of their next waypoint.

As it flies along this path, the flight will INTERCEPT enemy aircraft between Start and waypoint 1, look for ground forces to destroy (CAS) between waypoint 1 and waypoint 2, and will prepare to BOMB the target at waypoint 3 as soon as it passes waypoint 2.

The possible actions are:

NOTHING: The flight will take no action. It will simply continue on to the next waypoint. Aircraft on the flight will defend themselves if attacked, but they will not actively search for enemy aircraft or ground units.

CAP: Combat Air Patrol. The flight will seek to protect the area along their flight path from enemy aircraft. Aircraft will not attempt to locate or destroy any unfriendly ground units they encounter, nor will they stray very far from their assigned flight path to chase enemy planes. You can use a string of CAP waypoints to make your aircraft circle an area (see LOITER). Use this action to provide air cover over a localized area. Use INTERCEPT for wider coverage.

CAS: Close Air Support. The flight will actively search for unfriendly ground units to destroy. Aircraft will not attempt to locate or destroy enemy aircraft. Since the aircraft in the flight will need time to select A-G weapons and acquire targets, any CAS waypoint should be placed at least seven miles from the previous waypoint.

S AND D: Search and Destroy. This option combines the functions of CAP and CAS. The flight will engage and destroy all unfriendly aircraft and ground units it can find.

BOMB: The flight will bomb the target chosen with the Target button (described below). Since all planes in a flight will bomb the same target, you should set up a flight for each target to destroy multiple targets at one site. If the waypoint is not near a target site, no target can be selected and the flight will drop their bombs on the dirt. Computer-

controlled planes will only make one pass at the target. The aircraft in the flight may need up to 15 miles to select weapons and acquire their target for this action. You can only choose BOMB if you have been assigned to a bombing mission.

INTERCEPT: The flight will engage and seek to destroy all enemy aircraft they detect. Use this action for a wide area defense and for aggressive patrols. Do not use it to defend a localized area because the flight may wander far from their assigned flight path to pursue hostile aircraft, leaving the area undefended. Use CAP instead.

LOITER: This action is used in conjunction with CAP to set up a continuous patrol.

Normally after passing a CAP waypoint, the flight will continue on to the next waypoint. Using LOITER, however, you can instruct the flight to repeat a string of CAP waypoints until they run low on fuel. To do this, create a number of consecutive CAP waypoints around the area you want the flight to patrol. After the last CAP waypoint, create a LOITER waypoint. When the flight reaches the LOITER waypoint, the pilots will calculate the fuel needed to redo the circuit. If they have enough, they will continue the patrol; otherwise they will return to base. Note that the flight will only repeat a consecutive string of CAP waypoints immediately preceding the LOITER waypoint. If a waypoint of another action separates the CAP and LOITER waypoints, any CAP waypoints before this other action are not repeated. No waypoints other than CAP can be repeated with LOITER.

ESCORT: The flight will protect a corridor around their assigned flight path from incursion by enemy fighters. They will stay as close as possible to their flight path and will not engage aircraft that do not pose an air-to-air threat to the escorted flight, such as strike aircraft or non-aggressive fighters. To use this action effectively, the speed and flight paths of the escorting flight should match those of the flight it is escorting.

LAND: This should be set only at your home airfield. This action will automatically be set for the last waypoint of the route.

TAKEOFF: The TAKEOFF action will only affect your personal F-16. The action can only be assigned to the start waypoint of your flight path and only when this waypoint is over your home base. The wingmen in your flight will already be in the air circling the airfield waiting for you to take off.

Target: Selecting this button will cycle through the target frag list and assign the displayed target to the flight. The frag list contains the most significant military targets at the site, in order of importance. The Target button will only be enabled when the Action button displays BOMB. If you move the waypoint away from the site, the target selection will be reset to the top of the list, even if the waypoint is subsequently returned to that site.

Zoom to Target: Clicking this button will zoom the map display to a 3-D close-up of the assigned target to help you identify your objective when you reach the target site. The zoomed image will rotate, giving you a 360° view of your target, until you click the mouse button or press the Enter key.

Once you are satisfied with your flight plan, select the Assign Pilots button.

Assign Pilots screen

The Assign Pilots screen allows you to select particular pilots to fly the F-16s in a mission. You will only be able to assign pilots to the F-16s in your flight. All other aircraft will have their own pilots automatically assigned. If your pilots fly on too many consecutive missions, they will become fatigued and their performance will drop. The pilots assigned when you first enter the Assign Pilots screen will be the freshest, but if you reassign pilots, be aware of the Fatigue rating of your pilots given on the Pilot Information screen.

During the mission, you may receive radio messages on the top of the screen from other aircraft. You can recognize the F-16 pilots from your squadron by their callsigns. Non-F-16s will be identified by their aircraft type (A-10 #1, C-130 #3, etc.). An explanation of these radio messages can be found in **Section IX: Flight**.

Pilot roster: The pilot roster is displayed on the small video screen on the right. This is a list of all the F-16 pilots in your squadron. To assign a pilot to an aircraft, simply highlight a name on the list with the scroll arrows, then select the F-16 you want him to fly. The pilot that was assigned to that aircraft will be returned to the roster.

Flight #: This button cycles through the flights of aircraft.

Pilot Information: This button will bring you to the Pilot Information screen where you can view the pilots in your squadron.

Pilot Information screen

The Pilot Information screen allows you to view individual pilots in your squadron. The left side of the screen contains important information about the pilot such as the number of sorties (missions) flown, the number of enemy aircraft shot down, the number of ground targets destroyed, and any medals and commendations that have been awarded. In addition, you can view the pilot's face, name, rank and callsign. (A complete explanation of pilot abilities can be found in **Section V: Squadron Ready Room**.)

In a campaign setting, use this screen to determine who is best suited for a particular mission. For example, if you were conducting a bombing mission, you would look for a pilot who is particularly skilled in Bombing Accuracy and Flying Ability to accompany you on your bomb run.

Pilot roster: To view the statistics of a particular pilot, highlight the pilot's name on the small video screen.

Name: To change a pilot's name, select this button and type in the new name. The new name can have up to 12 letters.

Callsign: Use this button to change a pilot's callsign. The new callsign can have up to 15 letters. Any radio messages you receive from a pilot will use the callsign, rather than the pilot's name.

Change Face: Press this button to cycle through the available faces for your pilot.

Awards: Select this button to change the left side of the screen to display the awards a pilot has received instead of the pilot information. Awards are given to recognize excellent performances in combat. To redisplay the pilot information, select the Information button (which has replaced the Awards button in the menu).

Done: Select this button to return to the Assign Pilots screen.

Load Armament: When you are satisfied with your pilot assignments, press this button to advance to the Load Armament screen, the last step before takeoff.

Load Armament screen

The Load Armament screen allows you to customize the weapons load of the F-16s in the mission. The planes will already be loaded with a basic set of weapons to carry out their assigned mission, but you can change the armament if you wish.

Loading Armament: The left side of the screen shows a picture of an F-16, a number of buttons and a weapons display. The F-16 has four pylons or "hard points" per wing as well as a centerline mount on which weapons and other stores can be loaded. Note that the heavier weapons and stores can only be loaded on the inner pylons. These items will also be both loaded and dropped in tandem to maintain the aircraft's balance during flight. The M61A1 20mm cannon is mounted internally and is always loaded with 515 rounds.

To load a weapon or another type of store, first select the category of weapon with the buttons on the bottom of the screen. Then select the Load button. You may also click directly on a weapon or store on the F-16 to bring up its selection in the weapons display window. You have a choice of A-A Missiles, A-G Missiles, A-G Bombs and Other Stores.

A-A Missiles:

You can load three different air-to-air missiles: the AIM-9P Sidewinder, the AIM-9M Sidewinder and the AIM-120 AMRAAM.

> **AIM-9P and -9M:** The Sidewinders are heat-seeking missiles. The AIM-9P is a rear-aspect missile with an effective range of approximately 10 miles. The AIM-9M is an all-aspect missile with a range up to 10 miles. The rear-aspect AIM-9P requires that you be behind an enemy aircraft in order to get a good lock. The all-aspect AIM-9M can lock on to an aircraft from any angle or aspect.

AIM-120: The AMRAAM is an active-homing radar-guided missile which has an effective range of approximately 25 miles and is designed for use beyond visual range (BVR). The problem with carrying AMRAAMs is that each one of them weighs nearly twice as much as a Sidewinder. This affects your aircraft's maximum Gs and drag, which are major factors in air-to-air combat.

A-G Missiles:

The F-16 can carry four types of air-to-ground missiles and one air-to-ground rocket launcher: the AGM-65B and -65D Mavericks, the AGM-45A Shrike, the AGM-88A HARM and the LAU-5003A rocket launcher.

AGM-65B and -65D: The difference between the AGM-65B and -65D is that the -65B is optically-guided while the -65D is infrared-guided. The AGM-65B is much more effective in the daytime, while the -65D can be used at night. Both Mavericks are effective against tanks, trains and other small targets. These two weapons have an effective range of approximately 14 miles.

AGM-45A: The Shrike anti-radiation missile is designed to take out SAM sites and radar installations. It has an effective range of approximately 12 miles.

AGM-88A: The HARM anti-radiation missile is similar to the Shrike. The HARM has twice the range and weighs twice as much as the Shrike. The effective range of the HARM is approximately 30 miles.

LAU 5003A: This rocket launcher contains 19 small rockets which are fired individually. It has an effective range of approximately 3–4 miles and is primarily used for CAS on "soft targets" such as trucks, jeeps and infantry.

A-G Bombs:

You can load seven different types of bombs: the Mk82, the Mk82HD, the Mk83, the Mk84, the Durandal, the CBU-84 and the optically-guided GBU-15.

Mk82, Mk83 and Mk84: These weapons are standard iron bombs that have been used in one form or another for the past 20 years. The differences between them are the munitions load (500, 1,000 and 2,000 pounds respectively) and the corresponding weight. Base your choice of iron bombs on the size and "hardness" of the target.

Mk82HD: The Mk82HD (High Drag) bomb should be used instead of the other iron bombs for low altitude drops so that the bombs will decelerate sharply and explode behind, rather than underneath, your plane. It otherwise contains the same munitions load as the Mk82.

Durandal: The Durandal (also known as the BLU-107/B) is only used for destroying runways. Upon impact, the Durandal will plow under the surface of the runway and explode outward. This will buckle the runway and create a sub-surface cavity much more difficult to repair than a normal bomb crater.

CBU-84: The CBU-84 releases a cluster of 202 bomblets that disperse over a wide area. Use this weapon to defeat infantry and other soft targets such as trucks, jeeps and light armor.

GBU-15: The GBU-15 is a precise optically-guided bomb that is used to destroy large targets like nuclear power plants and factories. It can also be used to destroy important hardened structures like command bunkers and aircraft shelters. It operates very much like a Maverick missile, but has an effective range of approximate five miles.

Other Stores:

In addition to any weapon systems you may load, you also have the option of equipping your F-16 with external fuel tanks or an ALQ-131 ECM pod.

External fuel tanks: You have your choice of two different fuel tanks — a 300-gallon tank that is loaded under the belly of your plane or two 370-gallon tanks that are loaded on the wings. Depending on the target distance of your mission, you may want to choose one or the other of these options. Remember, however, that adding additional fuel tanks will severely hamper your maneuverability.

ALQ-131 ECM pod: The ALQ-131 is an electronic countermeasures device designed to defeat radar lock-on from SAMs on the ground. It is primarily used on air-to-ground missions but is moderately effective against enemy aircraft radar lock-on. However, there is a catch. Turning on your ECM pod broadcasts your position to every enemy aircraft in the area. Because the ECM pod can only be mounted on the aircraft centerline, it cannot be loaded with the 300-gallon fuel tank in place.

To add or subtract stores from your aircraft, choose a weapon in the selected category with the scroll arrows to the left of the weapons display, then simply select either the Load or Unload buttons just below the F-16 picture. The number of weapons loaded and the total number of weapons in stock are just to the right of the Load/Unload buttons. The # Loaded display will tell you how many units of a weapon are currently loaded and how many more could be loaded. The # Available button tells you how many are in your storage reserves.

Flight #: This button cycles through the flights of allied aircraft.

F-16: This button cycles through the aircraft in the current flight. The leader of the flight will be indicated in this button by the term LEADER. Wingmen will be indicated by the term 1st WING, 2nd WING, etc.

Clear All Weapons: This will remove all weapons and other stores from the current F-16.

Default Load: When you first enter the Load Armament screen, the computer will have determined a proper weapons load to carry out the aircraft's assigned mission. Select this button if you wish to cancel any changes you have made and restore the default load.

Copy Leader: The Report button will change to Copy Leader when you switch to one of your wingmen and begin to load weapons. Press the Copy Leader button to automatically load the current aircraft with the same weapons as the leader.

Aircraft Information: The screen in the lower right corner displays the current F-16's loading information — its takeoff weight, the maximum Gs it can pull (with the current weight) and the amount of drag affecting the F-16. The higher the drag factor, the more "resistance to flight" the plane will have. Drag is based on the shape and weight of the armament loaded. Determining the best configuration for your aircraft is a balancing act between firepower, maneuverability and range. The success of many missions may be determined by your decisions here.

Takeoff: Select the Takeoff button to begin the mission. Refer to **Section IX: Flight** for detailed instructions on flying and using weapons.

Flying the mission

Once you click the Takeoff button, you will be placed in your cockpit on the runway. Now your mission begins in earnest. You need to complete three steps in order to finish your mission: 1) Fly to the mission area, 2) Accomplish the mission objective, and 3) Return to your home airfield.

1) Fly to the mission area

Whether you're on a bomb run, intercept or close air support mission, you will always have to reach a target area. Your first priority is to reach that target area in one piece. Your F-16 has some features that can help you find and reach that target quickly: the autopilot and accelerated mode.

Finding the target

To find your target, simply follow the route marked by your waypoints. Since most of the navigational aides you have are based on the waypoints set up in mission planning, you should memorize which actions you are supposed to take at each waypoint. Two indicators on the aircraft HUD will help you reach the waypoints. On the heading scale there is a marker indicating the direction of the waypoint. On the right-hand bottom of the HUD, you are given the distance to the next waypoint in the form "25D1." The first number is the distance, in this case 25 nm. "D" is for "Destination, and the last number is the waypoint. Once you reach a waypoint, the indicators will switch to the next waypoint on the route. You can also request waypoint information from the AWACS plane by pressing Shift N. To bypass a waypoint, you must request permission from the AWACS with Shift B (you will not be able to bypass your last waypoint). Pressing Shift V requests permission to revisit a previous waypoint.

Autopilot

When you engage the on-board autopilot (by pressing the $\boxed{\text{A}}$ key), your F-16 will turn immediately toward the next waypoint and attempt to follow any of the instructions you gave to that flight route in the Set Waypoints screen. You can find out where your next waypoint is by asking the folks in the AWACS plane for directions ($\boxed{\text{Shift}}\boxed{\text{N}}$).

Accelerated mode

One fighter pilot described a combat mission as "three hours of boredom and ten minutes of stark terror." Fortunately, in the simulation we have added an accelerator mode to cut out the boredom. The terror is your problem.

By pressing and holding the $\boxed{\text{Tab}}$ key, however, you can increase the rate of events in the simulation. The speed of all aircraft, ground units, missiles, etc. will be increased by four times (4x). If you press the $\boxed{\text{Shift}}$ and $\boxed{\text{Tab}}$ keys simultaneously, your plane will be locked into accelerated mode. You can go back to normal mode by pressing the $\boxed{\text{Tab}}$ key again. However, if enemy planes enter your airspace when you are in locked accelerated mode and you don't turn it off, you may find yourself with a missile up your tailpipe!

Accelerated mode is useful for flying through the "dead space" in the world. For example, if you know that the next 20 miles of territory are empty of threats, you can use the accelerated mode to quickly get through this area.

Warning: You should engage autopilot before locking accelerated mode. If you don't, you might become the world's biggest lawn dart.

2) Accomplish the mission objective

When you reach the target area for your mission, you should make your best attempt at completing your mission before returning home. Obviously, if the other three planes on your flight have been downed and you're up against six MiG-29s, you shouldn't risk your plane trying to take out more ground targets. Of course, if you *do* manage to defeat those six planes, you'll surely be up for a high commendation!

Remember that any computer-controlled planes will only take one run at a target on a bombing mission. If you fly over a target for another pass — especially one that's heavily defended — you're likely to come away with casualties.

Ejecting

You can eject from your aircraft by hitting $\boxed{\text{Ctrl}}\boxed{\text{E}}$ three times in succession (Eject! Eject! Eject!). With any luck — and a lot of skill! — you'll never have to eject from your aircraft.

3) Return to your home airfield

Granted, this sounds obvious, but returning to your home air base is the most crucial part of your mission. Even if you are successful in destroying your mission target and fighting enemy planes, if you're careless on the way back, you might get jumped and lose half your flight. Here are a couple of tips to help make this return journey as uneventful as possible:

1. *Stay off the accelerated mode key until you enter friendly airspace.* The less you rely on accelerated mode in enemy territory, the safer you will be. As mentioned earlier, you don't want to be zooming back home and suddenly find yourself plunging earthward due to a "rendezvous" with an enemy missile.

2. *Don't fly too low to the ground.* The last thing you want on your return trip is to be shot down by enemy ground fire.

Landing and ending the mission

Once you finish your mission and get back to your home air base, you need to land your plane. Any wingmen or other flights will land on their own. After you touch down, roll to the end of the runway and stop, bring up the menu bar by pressing [Esc] and select End Mission from the FILE menu.

If you select End Mission *before* landing, the simulation will calculate the probability of your squadron making it home safely. It will take into consideration your fuel state and any enemy air defenses between you and your home base. Some of your aircraft could make it back, some might not. The closer you are to friendly airspace when you select this option, the more likely your planes will make it home.

The Abort Mission option differs significantly from the End Mission option. Abort Mission will terminate your current mission, return you directly to the War Room and act as if that mission never happened.

On occasion, you may not have enough fuel to return to your home air base or your bird might be so damaged that you have to attempt an emergency landing.

Landing at another friendly air base

Occasionally, you may be so low on fuel, perhaps due to jettisoning your external fuel tanks or overusing your AB, that you don't have enough fuel to make it back to your home base. You can attempt to land at another friendly air base on the return trip, but the penalty for doing so is that the aircraft and pilots that land there will not be able to return to their home base and thus the duty roster until the first mission of the next day. It goes without saying that you should avoid landing at an enemy air base unless you want to see what the war looks like as a POW.

Emergency landings

There may be times where your bird is so shot up that you can't even make it to a friendly air base, so you may be forced to attempt an emergency landing. If you're over enemy territory, if at all possible, try to keep your bird in the air until you enter friendly territory before ditching. Otherwise you risk capture. Also, when looking for a place to set down, roads are your best bet.

Debriefing

After you end the mission, you will be debriefed. The debriefing will first trace your flight path, describing all the events that occured, and then it will evaluate the mission as a whole. This evaluation will included a summary of kills and losses and you will be told whether the group commander rates the mission a success or failure. An awards ceremony to reward the valor of any deserving pilots will follow if any pilots are eligible. Afterwards, the Occupation screen will show you the state of the ground war.

Mission Summary

The first part of Debriefing is known as the Mission Summary. During the Mission Summary, you will be given a detailed breakdown of what your flight did on your mission. Every enemy aircraft, SAM or ground unit you encountered will be reviewed, along with the results of those encounters. You will see a review of the weapons you fired and whether or not any aircraft (both friendly and enemy) were downed.

Your flight path will be drawn on the map, and at each encounter the video display at the right will describe the events that occurred.

Medals and awards

Purple Heart
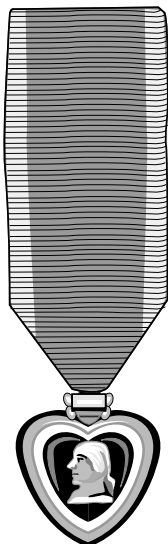
Air Force Cross
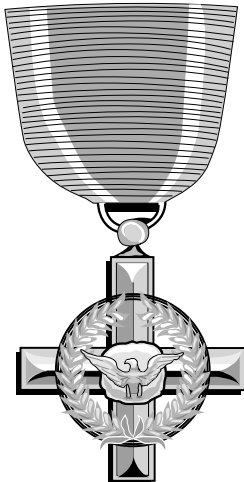
Flying Cross
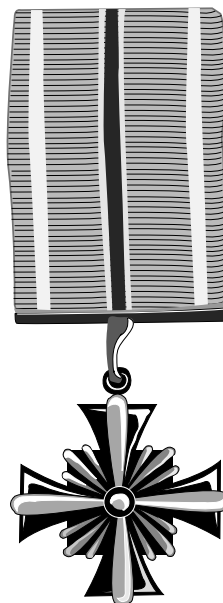
Air Medal
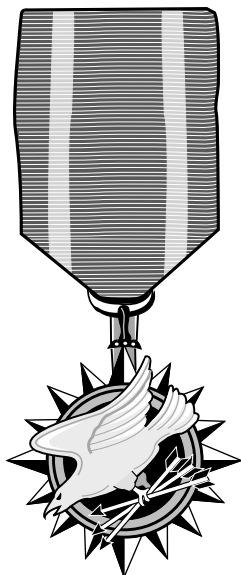
Medal of Honor
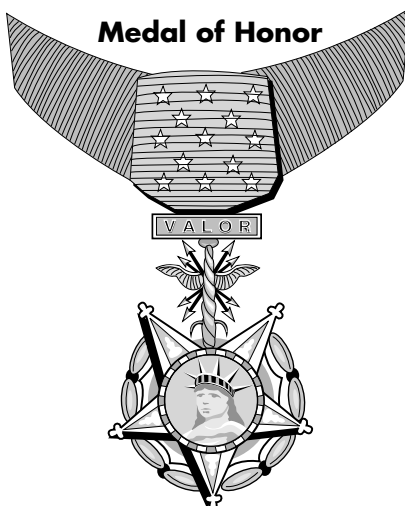
Silver Star
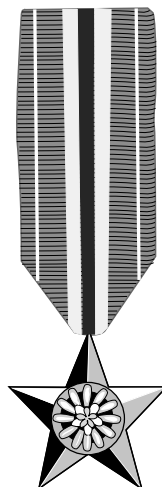
Bronze Star

VALOR
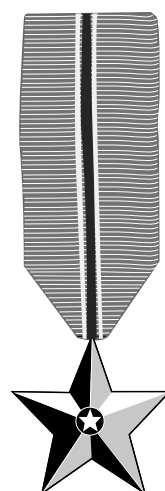
Before the Debriefing, you may attend an awards ceremony where one or more pilots receive medals. If this animation doesn't appear, it means that none of your pilots was eligible for medals or citations.

A pilot may receive any medal after only one sortie, but it is more likely that a medal will be awarded after repeated successful flights. Medals are acquired through the accumulation of "points." You earn points for such things as shooting down enemy fighters or bombers, assisting in an air-to-air kill, destroying or damaging your primary targets, and for completing your mission.

The following medals may be awarded to an individual pilot and are listed in order of importance (except for the Purple Heart, described at the end of the awards section):

Air Force Medal of Honor
The Air Force Medal of Honor is the highest award that the Air Force can bestow. It is given in the name of Congress to persons who distinguish themselves by extreme bravery, risking their lives above and beyond the call of duty, while in actual combat with an enemy of the United States or its allies.

The Medal of Honor is a very rare award and is only given in extraordinary circumstances.

Air Force Cross
The Air Force Cross is awarded for tremendous heroics, but ones that don't quite justify an Air Force Medal of Honor. It is given to any person serving with the U.S. Air Force when engaged in action with an enemy of the United States or when serving in conjunction with allied forces engaging opposing foreign forces.

The primary difference between this award and the Air Force Medal of Honor is the degree of heroism and actions taken.

Silver Star
The Silver Star is awarded to a member of any branch of the U.S. Armed Forces for gallantry when engaged in action with an enemy of the United States or when serving in conjunction with allied forces engaging opposing foreign forces.

Distinguished Flying Cross
The Distinguished Flying Cross is awarded to a member of any branch of the U.S. Armed Forces who has distinguished himself by "heroism or extraordinary achievement while participating in an aerial flight." The requirements for this award need not include the engagement of enemy forces.

Bronze Star
The Bronze Star is awarded to a member of any branch of the U.S. Armed Forces who has distinguished himself by heroic or meritorious achievement or service, not necessarily involving participation in aerial flight, when engaged in action with an enemy of the United States or when serving in conjunction with allied forces engaging opposing foreign forces.

Air Medal

The Air Medal is awarded to a member of any branch of the U.S. Armed Forces who has distinguished himself by meritorious achievement while in active flight. This award is given for both combat and non-combat actions.

Purple Heart

The Purple Heart is awarded to any member of the U.S. Armed Forces who is injured while in combat. It is also given posthumously to the next of kin for those who died from their wounds or were killed in action.

"Life after death"

The "life after death" feature allows you to view the action in a mission even if the plane you're flying has been destroyed. If your plane crashes into the ground or you're wiped out by a missile, the mission will not immediately end. A dialog box will inform you of your death and ask if you wish to watch the rest of the mission from your wingmen's point of view (if you have any on the mission).

You can now see the action from any of your wingmen on the flight by pressing 7 to change your view from one wingman to the next. If you want to look at a different target from the wingman's view, press T. If all your wingmen are destroyed or the mission is completed, the mission will end. Otherwise, you can end the mission by selecting End Mission from the FILE menu.

Winning or losing a campaign

Eventually all good things must come to an end (and, fortunately, the bad things too). The Air Force cannot win the war by itself; the infantry grunts must still trudge, step by step, into enemy territory and plant the flag in the hill of dirt that represents victory. Your performance in the air can make their trip either a Sunday stroll forward or a bloody march backward. Use the Occupation screen to view the progress of the ground forces. This is probably the best indication of how well the war is going.

When the ground troops reach the campaign objective, your side will win the war. If the enemy reaches its objectives first, however, you will lose. Hopefully, you can then take the lessons you learned from this war into a new theater of conflict.

Campaign strategy

To help you win a campaign, we've provided some more information about the occupation map, victory conditions for each mission type and details on mission debriefing.

Occupation map

Each theater has been divided into a number important strategic sites (about 80 or so in each theater). These sites include airfields, cities, troop staging areas, bridges and other important positions within the boundaries of the theater's region. (You can see all of the sites by using the STRAT/TACT button at the bottom of the campaign interface.) The ownership of the sites are color-coded: red for enemy- and blue for ally-controlled territory. The Occupation map (in the Debriefing screen or the Report screen) will show color-coded rings.

At the beginning of a campaign, Central Command determines which areas it must control in order to cause a collapse of the enemy's war-making infrastructure. The enemy is also doing the same — assessing your crucial areas for weaknesses and potential crippling blows. Throughout the war, CentCom will occasionally send your squadron to these potential hot spots (because you're the best, of course!). Successfully completing these missions will gain more toeholds towards an allied victory.
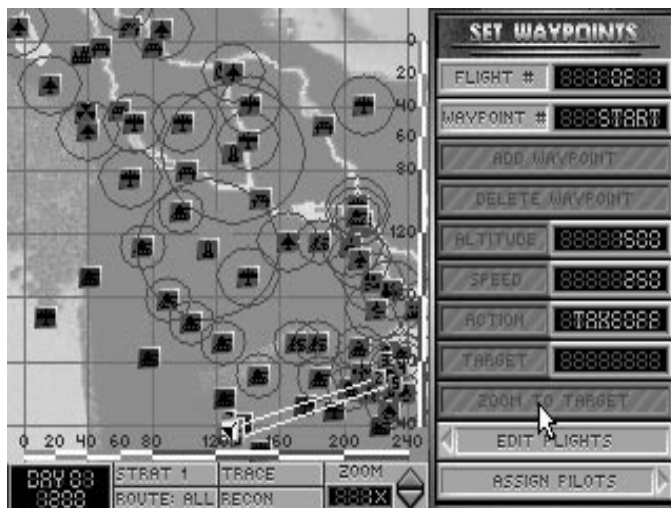
The front line is where blue (friendly) and red (enemy) sites are adjacent to one another. These are the major areas of dispute and the places where Central Command is most likely to send you on missions. Troops and weapons are sent to these areas along supply routes running deep within each side's territory. All territory is captured and lost on the front line. If you meet the daily mission success conditions (see "Victory conditions"), your forces will have a better chance to capture enemy territory. If your squadron fails to meet the victory conditions, it is more likely that the enemy will take over your territory. If your air base is on the front line when the enemy takes it over, you will have to "bug out" and relocate to another air base.

Missions are basically broken down into offensive, defensive and front-line missions. Offensive missions occur when CentCom decides you should attack a crucial site within enemy territory. These missions generally consist of bomb runs and escort missions. Defensive missions occur when the *enemy's* command structure sends aircraft or troops to attack a key site in your territory. These missions are primarily CAP missions, scramble missions and screen missions. Front-line missions are ones on the main battlefield where a vast number of ground troops are in operation. These missions are mainly CAS, ground strike and air superiority missions.

Ground forces color coding

In a campaign, you will need to determine which ground units are friendly and which are enemy. All three theaters use the same color-code system for units: green or gray for allied ground forces and brown for enemy ground forces. Black units are the burned-out husks of the casualties of battle.

Victory conditions

There are three different types of victory conditions: individual mission completion, daily mission success and campaign victory.

Individual mission completion

The Briefing screen will give you a mission description for each of the four missions you fly in a day. This will give you specific objectives which you must complete in order for your mission to be counted as a success. Failure in any area of the mission description will be tallied as a "mission failure."

The following section lists the requirements for successfully completing the missions you may be assigned. The mission title will be found on the Campaign Status screen (in the Report area). The mission briefing will be similar to the typical briefing given here, but will be tailored to the situation. Some of the missions require that you stay on patrol for at least 10 minutes. In reality, such missions would last much longer. As one pilot put it, however, "a combat mission is three hours of boredom and ten minutes of stark terror." We decided to leave out the first three hours and just give you the later 10 minutes.

Scramble

Typical briefing: "AWACS has detected a force of *6* enemy aircraft approaching *point A*. Intercept and destroy these aircraft. Do not let a single enemy aircraft escape."

- ✦ Destroy enemy aircraft before they can bomb allied targets.
- ✦ Destroy all aircraft assigned in the mission briefing.
- ✦ At least one F-16 must survive the mission.

Air Superiority

Typical briefing: "Lead a flight of *3* F-16s on a sweep of enemy airspace. Engage and destroy as many enemy aircraft as possible."

- ✦ Destroy more planes than you lose.
- ✦ Destroy at least one enemy aircraft.
- ✦ At least one F-16 must survive the mission.

Front Line Screen

Typical briefing: "Lead a flight of *4* F-16s on a defensive screen from *point A* to *point B*. Destroy any enemy aircraft encountered in this area. AWACs has reported a large strike force gathering in enemy territory. If they attempt to penetrate your sector, make sure that no enemy aircraft survive. Beware of decoys and do not stray from your assigned area. Stay on station as long as possible, but return to base when you are low on fuel or ordnance."

- ✦ Destroy any enemy aircraft encountered.
- ✦ Destroy any enemy intruders before they are able to bomb allied assets.
- ✦ Sustain your patrol for at least 10 minutes.
- ✦ At least one F-16 must survive the mission.

Combat Air Patrol

Typical briefing: "You are assigned to fly a combat air patrol over *point A*. Prevent enemy aircraft from destroying military assets at this site. Patrol the area until you are low on fuel or ordnance."

- ✦ Destroy any enemy aircraft attacking allied assets in your assigned sector before they can inflict casualties.
- ✦ Stay on patrol for at least 10 minutes.
- ✦ At least one F-16 must survive the mission.

Escort Transport (Milk Run)

Typical briefing: "Congratulations, you get today's milk run. A flight of C-130s are flying in supplies. Meet them at waypoint 2 and make sure they get here."

- ✦ Ensure that the transport aircraft make it safely to their destination.
- ✦ At least one F-16 must survive the mission.

Escort Strike or Bombers

Typical briefing: "Your mission is to escort *4 B-52s* on a strike against *point A*. On approach to the target, sweep ahead to clear any enemy interceptors from the strike force's path. If warranted by enemy air defenses, assign a flight to provide SEAD."

- ✦ Provide both fighter escort and SEAD support to ensure that strike aircraft make it to their destination.
- ✦ Your flight must fly to within 10 nm of the target waypoint.
- ✦ At least one F-16 must survive the mission.

Close Air Support

Typical briefing: "Elements of Company C, 3rd Armored Cavalry Division have come under heavy attack from an enemy tank column. The command ALO has requested Tac air to stem the enemy thrust."

- ✦ Destroy enemy ground forces at the assigned location in a timely fashion. To succeed you must ensure that the enemy takes more casualties than the allied forces.

Ground Strike

Typical briefing: "Tac air reconnaissance has spotted a large concentration of enemy forces near *point A*. Lead a flight of *4 F-16s* and destroy as many enemy units as possible."

- ✦ Destroy at least 20% of the enemy forces at the assigned location.

SEAD

Typical briefing: "Enemy air defenses at *point A* represent a significant threat to allied air operations. Lead a flight of *3 F-16s* and destroy as many anti-aircraft weapons at this site as possible."

- ✦ Destroy at least one-third of the enemy anti-aircraft weapons at the assigned location.

Bomb

Typical briefing: "Today's ATO calls for a strike against strategic targets located at *point A*."

- ✦ Destroy the target listed by the Target button on the Waypoint Setup screen at the location assigned by the mission briefing. You may select a different target with the Target button, but you may not move the waypoint to attack targets at a different location.

Tactical Air Reconnaissance

Typical briefing: "Fly to waypoint 2, then return to base."

- ✦ Fly to within 10 nm of the assigned destination.
- ✦ At least one F-16 must survive the mission.

Daily mission success

At the beginning of a campaign, each side has an initial offensive strength. This strength is used to determine how aggressive each side is in waging war on a given day. Each side's offensive strength is checked at the end of each day and each side will attack according to how high that offensive strength is.

Your squadron has a direct result on your side's offensive strength. Since you are the "elite of the elite" in F-16 squadrons, your success or failure affects the entire campaign strategy. If you successfully complete *more than half* of your missions in any given day (i.e., successfully complete three or four missions), the allies' offensive strength will increase. If you only successfully complete only one or two missions, the allies' strength will decrease.

Depending on each side's relative strength, this may not have any immediate effect, but it will have an underlying effect. For example, if the enemy's strength is very low and the allies' strength is very high, the likelihood of one day's worth of failed missions turning the tide of the war is much lower than if the two sides' strength was even at that time.

Campaign victory

In any war, a few key sites make up the "centers of gravity" of each opposing nation. These centers of gravity can include the seat of the government, important military bases, economic centers or even just a strategic crossroads. Without its centers of gravity, a nation loses either its ability or its will to continue fighting. Therefore, to achieve victory, your side must capture the opponent's centers of gravity while protecting its own. In a *Falcon 3.0* campaign, each side has three such centers (although their exact locations vary from campaign to campaign so that no two wars in the same theater will be exactly alike). The Theater briefing at the beginning of the campaign will outline your general objectives based upon the centers of gravity for that campaign.

A campaign will continue until one side has taken all but two centers of gravity from the other or until 15 days of fighting have elapsed. If neither side has achieved a substantial advantage at the end of 15 days, the politicians step in and the campaign ends in stalemate.

Mission Debriefing

The Debriefing has three main sections. The first section will trace your flight path, listing any events occurring during the mission. It will list only those events that involve your immediate flight. Such events as enemy aircraft shot down, enemy ground forces destroyed, wingmen lost and crashes with the ground will be listed. To continue with the debriefing, press the Continue button. Pressing Next Mission will skip the rest of the Debriefing.

After the Mission Trace, you will be informed whether or not any of your pilots received a medal. If none of them warranted a medal, this screen will be empty; otherwise, the pilot's name and the name of the medal will be displayed.

Finally, the Mission Summary portion of the debriefing will rate your mission a success or failure, providing a brief explanation if your mission was a failure. There may be several possible reasons for failing a particular mission; the Mission Summary will only list the most obvious.

If the Debriefing judges your mission a failure, you will be given one of the following or similar reasons:

- ✦ No enemy aircraft were shot down.
- ✦ You failed to destroy a single enemy unit.

If you are given one of these reasons for failing your mission, then you were assigned to attack a particular type of enemy unit but did not destroy even one.

- ♣ Too few enemy aircraft were shot down.
- ♣ You failed to completely destroy the enemy strike force.
- ♣ You inflicted only minor damage on the enemy forces.

In general, air-to-air missions require that you destroy a particular formation of aircraft or at least destroy more aircraft than you lose. Air-to-ground missions generally require that you destroy a significant percentage of the enemy troops at the assigned target.

- ♣ You failed to destroy the primary target.
- ♣ You hit the wrong target.
- ♣ You did not hit the assigned target.

You will get one of these messages if you fail to destroy the proper target at the assigned location on a bombing mission.

- ♣ You failed to reach your assigned target.
- ♣ You failed to reach your assigned station.
- ♣ You failed to escort the aircraft all the way to the target.

Some missions require that you fly to within 10 nm of your assigned target waypoint. This is to ensure either that you attack the correct targets or that you stay with escorted aircraft all the way to the target.

- ♣ The enemy conducted successful attacks through your sector.
- ♣ None of the escorted aircraft survived.
- ♣ Allied loses were unacceptable.
- ♣ Allied ground forces were defeated.

You will get one of these messages if you are assigned to protect allied troops or assets and the enemy succeeds in destroying them.

✦ The enemy operation succeeded.

You will get this message if enemy paratroopers are able to land and deploy to their assigned positions.

✦ Your flight was eliminated.

Air-to-air missions require that at least one member of your squadron survive.

✦ You ended the mission too soon.

You will get this message if you end the mission early, leaving allied forces unprotected and in danger.

The Mission Summary also tallies enemy and allied losses that occurred during the mission and provides the post-mission status of all your squadron's pilots who flew sorties during the mission. The status of a pilot can be active, injured, court-martialed, POW (prisoner of war), MIA (missing in action) or KIA (killed in action). Only pilots with an active status will be available for the next mission. Injured pilots will be put back on the active roster as soon as they have recuperated enough to fly. Pilots with any other status will never fly again. (Pilots who show up with an asterisk in front of their name have become so battle fatigued that their abilities are impaired. You may still select them for missions, but you should only do so as a last resort. A pilot who is so fatigued that he is incapable of flying is listed as injured.)

Pressing Continue after the Mission Summary will display the Occupation Screen, which shows the current state of the war in terms of the territory held by each side. This screen will only change once per day. From there you can replay the Debriefing from the start (in case you missed something), check your squadron records or go on to your next mission.

FLIGHT

Flight introduction

This section provides a synopsis of several parts of the manual. It covers the basics of flying the plane, selecting and firing weapons, the HUD, the various cockpit instruments, the Voice Message System, messages from your wingman, using the APG-66 Radar, the external views, takeoff and landing, and the menu bar.

You can use this chapter as a compact reference section for operating the simulator.

Flying the plane

Although your cockpit is crammed with instruments, the basic controls that deal with the phenomenon of flight are the stick and throttle. They make it possible to climb, dive, turn and bank. Once you gain mobility in the air with the stick and throttle, you can go after those choice targets.

Using the stick

The stick controls the direction of your aircraft as it moves through the air. When you move the stick, you move control surfaces on the wings, tail and rudder which change the direction or orientation of the aircraft. The stick has traditionally been placed between the knees of the fighter pilot and linked to the control surfaces through mechanical and hydraulic linkages. Things have evolved a bit in the F-16.

The stick in the F-16 is near the pilot's right arm and is called a sidestick controller. It senses force on the stick and passes that information to the flight control computer. The sidestick only has about one quarter of an inch of flex. The control surfaces are fed information from the flight computer and are moved by electric actuators. We'll usually refer the the sidestick controller as the stick in this manual.

You can use three different control devices to simulate movement of the F-16 stick. Throughout the manual, the stick will refer to whichever flight control device you are using.

Choose the flight control device you want to use from the System Setup screen. To change your input device, first select the Configuration monitor in the War Room. Then select the System Setup button at the top of the screen. You can choose the keyboard, the joystick, the CH FlightStick Pro or the ThrustMaster FCS to control the movements of the stick. (You may also change the flight control device while flying by pressing the [Esc] key and choosing the Control menu.)

Keyboard

In some ways the keyboard is closer to the real sense of control over the F-16 than the joystick. Like the ThrustMaster (described later), it simulates the hands-on-throttle-and-stick (HOTAS) arrangement in the F-16. From the keyboard, you can control movement of the F-16, adjust the throttle, select and fire your weapons, and manipulate your radar. The keyboard "stick" is surrounded by other controls that you need to fight and win.

The stick is controlled by four keys arranged like a cross. This arrangement is found in three places on the keyboard. In the alphabetic part of the keyboard, the [I] key pushes the stick forward, which pushes the nose down. The [M] key pulls the stick back, which pulls the nose up. The [J] key banks the plane left, and the [L] key banks the plane right. You can press two of these keys together at the same time to combine directions.

On the numeric keypad, the 8 key pushes the stick forward, the 2 key pulls the stick back, the 4 key banks left and the 6 key banks right.

The cursor keys also control the movements of the stick. The ↑ key moves the stick forward, the ↓ key moves the stick back, the ← key banks left and the → key banks right.
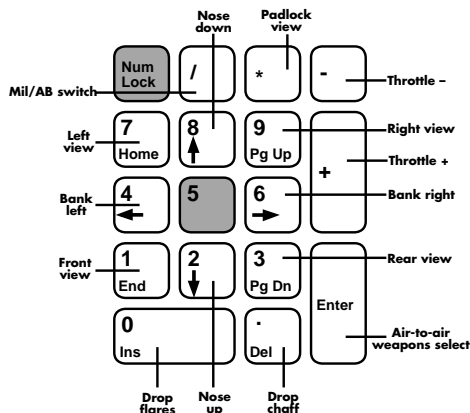
As long as you press a key, you will be applying pressure to the stick in that direction. When you release the key, you release pressure on the stick. As with a real stick, when you turn, you need to apply a bit of back pressure to the stick while you bank. If you were banking left, using the numeric keypad, you would need to press both the 4 and the 2 keys to keep your nose from dropping.

Joystick
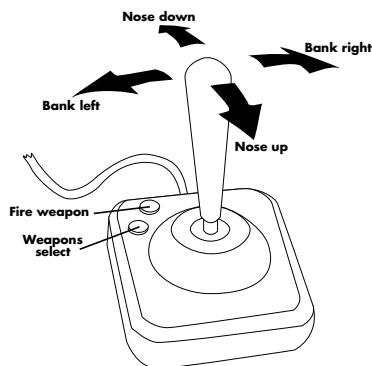
The joystick most closely matches the real sidestick from a physical point of view. You can get a great sense of flying by cranking on the joystick and watching the horizon spin. The direction you move the joystick controls the direction you move the F-16 stick. You will notice that if you bank to a side, you will also need to add a bit of backstick to keep the nose from dropping.

On the joystick, button A is used to select a weapon from whichever weapons mode you are currently in (air-to-air or air-to-ground) and button B fires the selected weapon.

If you are using a second joystick as a throttle, moving this joystick forward and back increases or decreases the throttle while moving it to the right and left applies pressure to the corresponding rudder. Button A on the second joystick switches between air-to-air (A-A) and air-to-ground (A-G) weapons mode, and button B engages the speed brakes.

Joystick calibration

To calibrate the joysticks, press the [Esc] key once you get into the simulation. Then select the Control menu. Choose Joystick and then Recalibrate. You will see a box with several buttons at the top and a small F-16 in the box. Follow the prompts below the box and center the F-16 by moving the joystick. Press the button when the F-16 is centered in the box.

Next, move the joystick to its limit to the left, to the right, forward and back. Then press the joystick button.

To save this calibration as your default, click the button "Save as Default." To simply use the current calibration, click "Exit." If you want to start over, click "Restart." If you have saved the calibration as a default, the next time you select the Joystick item from the Control menu, you can simply choose Default instead of Recalibrate and your last calibration will be used.

If you have a joystick with a throttle wheel, like the CH FlightStick or the Kraft Thunderstick, you can choose to calibrate the throttle wheel. (If you choose not to, use the [+] and [-] keys to control the throttle.) If you use the throttle wheel, you must first advance the throttle wheel several clicks and press the [+] key to start the engine. You will then be able to control the engine's RPMs with the throttle wheel on your joystick.

CH FlightStick Pro

The CH FlightStick Pro adds both a throttle wheel and a coolie hat to the basic joystick.

ThrustMaster

Weapons select

Fire weapons

A-A to A-G toggle
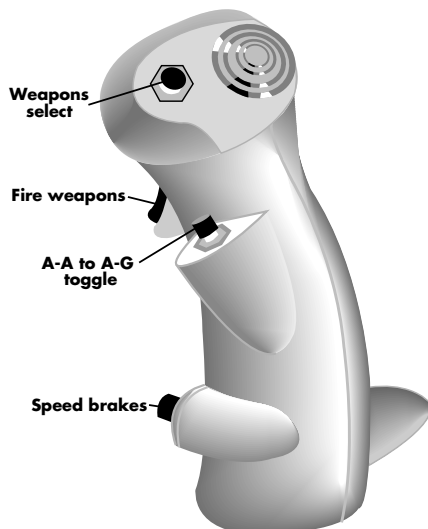
Speed brakes

The ThrustMaster FCS is a sidestick with multiple buttons, designed to give you a realistic feel for flying. On the sidestick, you can control the following operations: individual weapon selection, A-A/A-G weapons mode, speed brakes and the trigger. (Choose "ThrustMaster" only if you have a ThrustMaster FCS. If you have a ThrustMaster FCLS, WCS Mark II or TQS, choose "Joystick" instead of "ThrustMaster" at the System Setup screen.)

Coolie hat

You can control views in *Falcon 3.0* if you have a coolie hat on your joystick. If you choose either "ThrustMaster FCS" or "CH FlightStick Pro," you will be asked to calibrate the coolie hat. Once calibrated, push the hat back for Padlock View, left for Left View, right for Right View and forward for Forward View. If you're already in Forward View, pushing the hat forward will bring up the heads-up view (Scroll Lock).

Throttle and afterburner

The throttle controls your powerful Pratt and Whitney F100-PW-200 afterburning engine. You'll need to have good control over your throttle during takeoff, landing and fighting. The throttle is controlled by [+] and [−] keys on the top row of the keyboard and on the numeric keypad. As you press the [+] key, the throttle increases. The [−] key decreases the throttle. You read the current state of the throttle on the RPM Gauge.

The F-16 has an afterburner (AB) with five afterburning stages. Engage the afterburner with the [/] key on either the keyboard or the numeric keypad. When you engage the afterburner, your RPMs go immediately to 100% MIL power, no matter what the previous setting was. The [>] key advances the afterburner stage, while the [<] key decreases the afterburner stage.

You can determine the status of the afterburner by looking at the MIL/AB Indicator. When it says MIL, you are using your normal engine at some percentage of full MIL thrust. When you engage the afterburner, the light changes to AB1 since you've entered the first afterburner stage. This light will change to AB2, AB3, AB4 or AB5 as you increase the stages. Pressing the [/] key again will take you out of burner and back to MIL power from any afterburner stage. The MIL/AB Indicator will then read MIL.

Making a turn

Turning is very easy in the F-16. To turn, bank the plane in the direction you want to turn by moving your stick to the right or left. If you move the stick to the left, your plane will bank to the left. The more you move the stick, the more you will bank. You will see the horizon move in the opposite direction of your bank. For example, if you bank to the left, the horizon will tilt down to the right.

When you bank your plane, you will begin to turn in the direction of the bank. You will notice that if you simply move your stick to one side, you will bank, but your nose will also drop and you will begin a descending turn. If you want to simply bank without dropping, you also need to add some backward pressure to the stick as you bank to a side. Use the horizon as a guide and keep your nose on it as you turn. You will need to adjust the back pressure on the stick to keep your nose on the horizon. Back pressure on the stick not only keeps your nose from dropping, but it also increases the speed of your turn. Be aware that a sharp turn will increase your G load.

If your airspeed is below 450 knots (kts), you can also use your rudders to help turn. Press the ⬅ and ➡ keys for left and right rudder respectively. When you use your rudder to turn, the plane will turn without banking at all. You can increase the control and degree of turn by using a combination of stick and rudder. The rudders engage just below 450 kts, but their effect is minimal at this speed. As your airspeed decreases, the rudders begin to have more effect. Around 200 kts, the rudders are quite effective.

Weapons selection and firing

Depending on your targets and your intention, you will view and select different weapons systems and accessories through your Stores Management System. You will be able to tell which weapons you have selected by looking at the Stores Control Panel (SCP) and at the HUD. Each will give you information about the currently selected weapons.

Air-to-air

To cycle through the air-to-air weapons in the SCP, press the Enter key. Each time you press it, a new air-to-air weapon will be selected on the SCP display. The top line of the SCP shows the mode (in this case it will say A-A for air-to-air), the number of missiles loaded on your F-16 and the missile type. For example, a typical selection will read: A-A 2 AIM120. This means you are in air-to-air mode and have two AIM-120 radar-guided missiles selected. You don't have to arm individual missiles. The Fire Control Computer takes care of that for you.

The HUD also changes mode when you select a new air-to-air weapon. The HUD mode indicator shows the number of weapons available and the type. The Aiming Reticle also helps you see which weapon you have selected. Its size depends on the type of missile you select. It will be large for AIM-120s, medium for AIM-9Ms and small for AIM-9Ps. If you go to guns, the Aiming Reticle disappears and you get the M61 Aiming Funnel.

The Fire Control Computer also gives you a clear signal when you have locked on to a target with your missiles. When you are locked on and the missile is tracking, the Aiming Reticle in the HUD will blink and the target diamond will attach itself to the Target Designator Box. At the same time, you will hear the tone from the seeker head of your Sidewinder.

Just because you have good tone from the seeker head doesn't guarantee that your missile will hit its target. You must meet many conditions to have your missile in parameters, and even then, an enemy pilot will take a variety of measures to spoof your missile. For example, if you're following an enemy aircraft that heads toward the sun, your heat-seeking missiles may be fooled by the heat source. Your best is to keep your position until the enemy is away from the sun before you fire your missiles.

Air-to-ground

To cycle through the air-to-ground weapons on board, press the Backspace key. The currently selected weapon will show up on the SCP. The top line will read A-G for air-to-ground, followed by the number of bombs or missiles and weapon type. A typical top line might read: A-G 4 AGM-65D. This means that you have four AGM-65D Maverick air-to-ground missiles selected.

The firing cues for your air-to-ground weapons vary with the weapon. You will find more information about using your air-to-ground weapons later in this section.
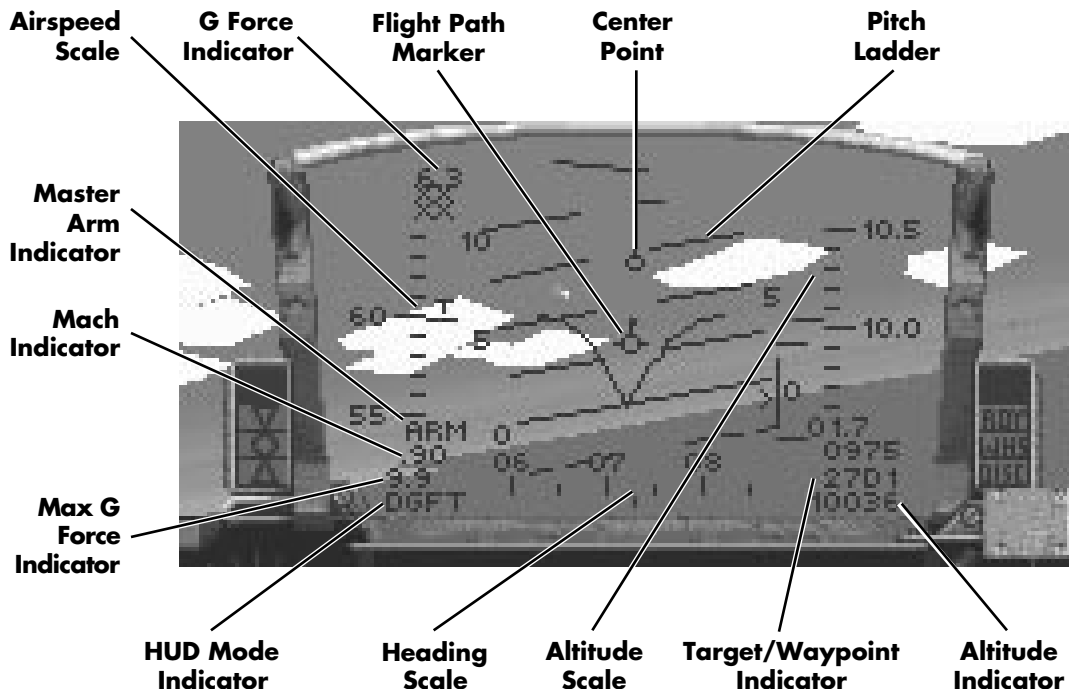
Head-Up Displays (HUDs)

The HUD is the most important instrument you will use in *Falcon 3.0.* It is a piece of glass just inside the canopy upon which is projected targeting data for your weapons systems and information on your current altitude, speed and heading. It also shows distance to waypoint, the current G force on your aircraft and a host of other invaluable data. The value of the HUD is that this information is projected through the pilot's line of sight, so you don't have to look down into the cockpit to get critical flight or tactical information. During a "fur ball" (a frantic combat engagement), moving your eyes from the outside environment to the inside of your cockpit can be fatal. Things just happen too fast. When flying and fighting, you'll find that most of your attention is focused on the HUD.

The HUD has a number of different modes, and their characteristics change depending on which weapons system is currently active. There is also a special HUD mode designed for use with landing. This is known as the ILS HUD, and it is described at the end of this section. Unless otherwise noted, these descriptions are for the Model A HUD.

HUD basics

The following displays are common to every HUD mode.

| Airspeed Scale | G Force Indicator | Flight Path Marker | Center Point | Pitch Ladder |

| Master Arm Indicator |
| Mach Indicator |
| Max G Force Indicator |

| HUD Mode Indicator | Heading Scale | Altitude Scale | Target/Waypoint Indicator | Altitude Indicator |

Airspeed Scale

The Airspeed Scale is located on the left-hand side of the HUD and displays your current true airspeed (TAS) in tens of knots. For example, the number 40 would indicate that your F-16 is flying at 400 kts TAS. The hash mark with the "T" above it, located about halfway up the scale, is where to read the TAS. If you are flying with the Model C HUD, you will simply see the current airspeed displayed as a single value on the left-hand side of the HUD under the letters SPD.

Altitude (ALT) Scale

The Altitude Scale is located on the right-hand side of the HUD and measures your current altitude above sea level (ALT) in thousands of feet. This differs from the Altitude Indicator because the Altitude Indicator displays the altitude above ground level (AGL). You read the ALT by viewing the hash mark about halfway up the scale. If you are flying with the Model C HUD, you will simply see the current altitude displayed as a single value on the right-hand side of the HUD, under the letters ALT.

Altitude (AGL) Indicator

The Altitude Indicator is located in the lower right-hand corner of the HUD and is used to measure your current altitude above ground level (AGL) in feet. It differs from the Altitude Scale because the Altitude Scale shows your altitude above sea level (ALT). For example, if you are flying over mountainous terrain, the Altitude Scale may show 3,000 feet, but the Altitude Indicator may display only 450 feet. This means that while you are 3,000 above sea level, you are only 450 feet above the ground because of the mountain's altitude.

You will want to pay special attention to the Altitude Indicator when you are flying low-level missions. If you make the mistake of relying on the Altitude Scale, you may end up as a smoking hole in the landscape.

The altitude that is displayed in the various outside views, like the Track View, is always altitude above ground level. You need to know how far you are above the ground to keep from crashing, especially if you like skimming roads and buildings while flying in the outside views.

Center Point

The Center Point is located in the direct center of the HUD and is used as a reference point for other moving indicators such as the Flight Path Marker and Pitch Ladder.

Flight Path Marker

The Flight Path Marker displays changes in your flight direction. It's in the shape of a circle with three spokes representing your wings and tail fin. When you make directional adjustments to the aircraft, the Flight Path Marker will move to show you the direction you are currently heading. If you then let go of your stick, the Flight Path Marker will slowly drift back to the center of your HUD.

G Force Indicator

The G Force Indicator is located just above the Altitude Scale and displays the amount of gravity forces (Gs) you and your plane are sustaining at the current time. For example, if the reading shows 2.5, your body is feeling the pressure of 2.5 times regular gravity. Your G Force Indicator will read 1.0 when you are flying straight and level. By varying the maneuvers of your aircraft, you can experience both positive and negative Gs.

Heading Scale

The Heading Scale is located on the bottom of all A-A HUD modes and at the top of all A-G HUD modes. It displays your current heading in tens of degrees and is read by viewing the hash mark in the middle of the scale. Headings are 0° for north, 90° for east, 180° for south and 270° for west. If you are using the Model C HUD, the heading will appear as a single value under the word HEADING, at the bottom of the HUD.

If the HUD is damaged, you will need to refer to the compass on the Left View of your cockpit to get heading information.

HUD Mode Indicator

The HUD Mode Indicator in the last line on the left side of your HUD is used to display your current HUD type (A-A/A-G/ILS). From this designator and the Stores Control Panel, you can determine your presently selected weapon system.

A-A HUD modes:

- ↟ SRM (Short Range Missile): AIM-9P or AIM-9M Sidewinder missile
- ↟ MRM (Medium Range Missile): AIM-120 AMRAAM
- ↟ DGFT (Dogfight): M61A1 cannon

A-G HUD modes:

- ↟ CCIP (Continuously Computed Impact Point): Mk82/82HD/83/84 iron bombs, CBU-84 cluster bomb and LAU 5003A rocket launcher
- ↟ E-O (Electro-Optical): AGM-65B TV-guided Maverick missile and GBU-15 guided bomb
- ↟ A-G (Air-to-ground): AGM-45A Shrike and AGM-88A HARM anti-radiation missiles
- ↟ I-R (Infra-red): AGM-65D infrared-guided Maverick missile
- ↟ DUR (Durandal): BLU-107/B Durandal demolition bomb
- ↟ STRF (Strafe): M61A1 cannon

The other possible HUD mode is ILS. This will only appear if you have engaged the Instrument Landing System before runway approach.

Mach Indicator

The Mach Indicator is located just below the Master Arm Indicator and shows the current TAS as a percentage of Mach 1, the speed of sound.

Max G Force Indicator

The Max G Force Indicator is located in the lower left of your HUD, just below the Mach Indicator. It displays the highest amount of Gs you have pulled since takeoff. It is automatically set to 0 (zero) at the beginning of every mission.

Pitch Ladder

The Pitch Ladder is the set of lines running through the middle of the HUD. These lines indicate angle of climb or dive and also the angle of roll of your plane. (Angle of roll is how much your plane is turning relative to the horizon line.) As you climb or dive, these lines will move accordingly. The lines of the Pitch Ladder are oriented to match the horizon line (and the artificial horizon on your radar). As you bank, the lines of the Pitch Ladder will roll on the HUD to show you the orientation of the horizon.

The angles on the Pitch Ladder are in five degree increments. An angle of climb (a positive number) is shown with a solid line, while an angle of dive (a negative number) is shown as a dashed line. If you pull high Gs, your Pitch Ladder may move around your HUD, even to the point of disappearing for a moment.

Target/Waypoint Distance Indicator

The Target/Waypoint Distance Indicator is located in the lower right-hand corner of all HUDs, just above the AGL Indicator, and is used to determine distance to your current target or next waypoint. The number before the "D" indicates how many miles it is to the current A-G target or upcoming waypoint. The number after the "D" shows the number of the current waypoint on your flight route. You can change the current waypoint number by pressing [Shift][B] or [Shift][V]. This will force other planes on your flight (and your plane as well if you are in autopilot) to head directly for the next or previous waypoint respectively.

If your radar is currently locked onto an air-to-air target, you will see a distance-to-target indicator directly below the Altitude Scale. Normally the two lines below the Altitude Scale read as xxxx, but when you lock on to a target, they show the distance to the target (in tenths of a nautical mile) and the closure speed with the target. This information is also displayed on your radar.

If you are using the Model C HUD, the target distance, closure speed and altitude above ground level will be displayed in this same area, but will be labeled with R (for Range), C (for Closure) and A (for AGL).

Waypoint Caret

The Waypoint Caret appears on your HUD on the heading scale as an inverted V. This caret will be somewhere on the scale and indicates the direction to steer to head toward your current waypoint. If the caret is to the right of the HUD, you need to steer to the right. As you do, the caret will move towards the center of the HUD. When the Waypoint Caret is centered in the HUD on the heading scale, you are on the correct heading to your waypoint.

HUD warnings

Some HUD indicators only appear when you are in immediate danger.

Low Fuel Indicator

The Low Fuel Indicator is located in the lower left-hand corner of the HUD and appears when your on-board computer determines that you only have enough fuel to return to your home base. In addition, you will see a display in the bottom right of the HUD that reads, for example, Fuel 12. This means that you have 1,200 pounds of fuel left.

Arrowheads

A pair of arrowheads will appear in your HUD when you are in danger of colliding with the ground. They will begin at either side of the HUD and move toward the center of the HUD. The closer they are to the center, the greater the danger of ground collision. If the arrowheads begin to flash, you need to pull up immediately or else you will crash.

A-A Weapons HUD mode

You will see additional symbols and information on the HUD when you are in an air-to-air weapons mode. The symbols will vary with the weapon you have selected.

Target Designator (TD) Box

The TD Box is a small square that appears on the HUD when a target has been locked up with radar and is positioned in front of you. The TD Box provides you with a significant advantage because it tells you where to look to see the aircraft in space, even if it isn't close enough to be visible. If you continue to head towards a target marked in the TD Box, the TD Box will surround and stay with the target when it becomes visible as long as it is within the view of your HUD. If the radar lock on an enemy aircraft becomes unstable, the sides of the TD Box will change to broken lines. If this happens, don't fire a missile until you get a stable radar lock on the target.

Target Locator Line/Diamond X

When a target moves off the HUD, the TD Box disappears and is replaced by the Target Locator Line and the Diamond X symbol. The Target Locator Line is drawn from the small plus symbol at the top of the HUD (the target locator origin) to the edge of the HUD in the direction of the tracked aircraft. If you follow the Target Locator Line off the edge of the HUD, it will point in the direction to look for the tracked aircraft.

The Diamond X indicator is another indicator to help you locate a target that moves off the HUD. It appears on the edge of the HUD where the TD Box vanished. The Diamond X indicator is used to give you a horizontal or vertical vector to the target. For example, if the target disappeared off the left side of the HUD, the Diamond X indicator will appear somewhere on the left edge of the HUD. If you project a line from the Target Locator Line through the Diamond X into space, it will intersect the target.

By using both the Target Locator Line and the Diamond X, you can precisely locate a target even if it is off the HUD.
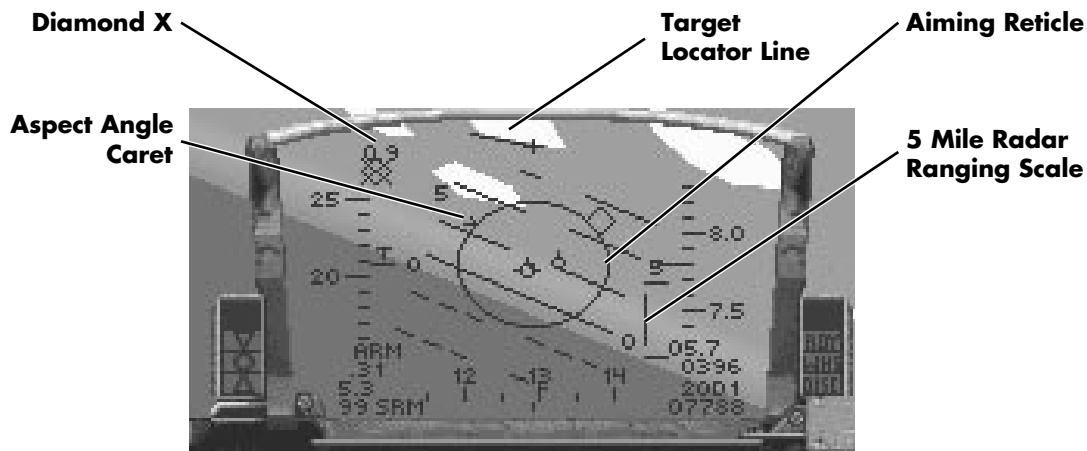
5 Mile Radar Ranging Scale

The 5 Mile Radar Ranging Scale is a vertical scale to the immediate left of the altitude scale. It has a tick mark at the top and the bottom of the scale, where the top mark indicates five (5) nautical miles and the bottom mark indicates zero (0) nautical miles. When the tracked target gets within five miles, a caret will appear on the left edge of the scale at the top. As the distance to the target decreases, the caret will move lower on the scale. Use this as a visual cue for missile ranging without taking your eyes off the HUD.

Aiming Reticle

The Aiming Reticle is the circle in the center of the HUD that indicates the optimum position for a good missile kill. Your target should be within the Aiming Reticle before you fire your missiles. The Aiming Reticle will differ for each type of missile you use. The smallest reticle is used for the rear-aspect AIM-9P Sidewinder missile. The medium reticle is used with the all-aspect AIM-9M Sidewinder missile, and the large reticle is used with the AIM-120 AMRAAM radar-guided missile. You can also look at the HUD Mode Indicator and the Stores Control Panel to clue you in on which missile you have selected.

Several symbols are associated with the Aiming Reticle:

Aspect Angle Caret

The Aspect Angle Caret is a small caret that is drawn along the outside of the Aiming Reticle. The caret is always pointing in toward the center of the circle. The aspect angle is an important value that represents a relationship between you and the enemy plane. It is used to determine the intent of the enemy plane and for determining if you are within the proper envelope for missile firing.

If the caret is at the bottom of the circle pointing towards the top of the HUD, the enemy is moving away from you in the direction pointed to by the caret. In other words, if the caret is at the 4 o'clock position, the target is moving away and to your left. If the caret is at the top of the circle, the target is moving toward you. You can confirm this by checking the closure rate on your radar. For the rear-aspect AIM-9P, you want to have an aspect angle of 60° or less (between 4 and 8 o'clock on the Aiming Reticle).

Distance Ranging Scale

The distance ranging scale is drawn on the circle of the Aiming Reticle. It is another distance-to-target indicator. It appears as a "gap" in the circumference of the circle. This gap appears at the top of the reticle and moves counterclockwise as the target gets closer. If you use the image of the circle as a clock, the top of the circle represents 12,000 feet. As the indicator moves to the 9 o'clock position, it means that the target is 9,000 feet away. Six o'clock represents 6,000 feet and so on. If you were using this scale to judge the distance for firing an AIM-9P missile, which has an optimum range of about two miles, you would want to fire when the scale reads about 10 o'clock, which is approximately 10,000 feet.

DGFT (Dogfight)

This mode is operative when you are using your M61A1 internal cannon. When you select this A-A HUD mode, a funnel device will show the path of your bullets. Your objective is to get the wingtips of the enemy plane within the boundaries of this funnel before you shoot. Remember, you need to pull lead and keep the enemy plane toward the small end of the funnel.

A-G Weapons HUD mode

Like the air-to-air HUD modes, air-to-ground weapons have their own special symbols that appear on the HUD to help you deploy your weapons. Another difference you'll notice is that the Heading Scale moves from the bottom of the HUD to the top of the HUD. This gives you an uncluttered view to the ground below.

CCIP (Continuously Computed Impact Point)

This HUD mode is used for iron bombs, CBU-84 cluster bombs and the LAU 5003A rocket launcher. For every weapon except the LAU 5003A rocket launcher, the CCIP display gives you a special bombsight known as the CCIP pipper. This bombsight consists of a vertical line drawn from the target locator origin, which ends with a circle with a dot in it. This is the infamous "death dot," and you should place it on the target you want to hit.

CCIP Pipper
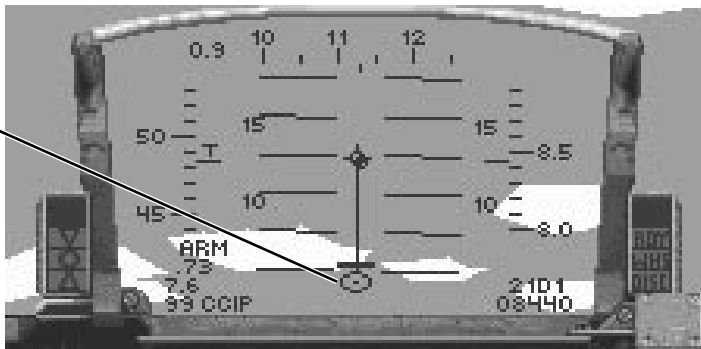
Once the dot is over your target, designate it by pressing the [Spacebar]. The line extends both up and down on the HUD. You will see a horizontal line cross it at the top and in the center of this line. As you near the target, the top horizontal line will move down the HUD. When it reaches the center horizontal line, the bombs are automatically released. You may manually release (or pickle) your bombs by pressing the [Spacebar] again after you have designated the target.

To clear a designated target, press the [X] (clear lock) key.

With the LAU 5003A rocket launcher, you will see a small aiming pipper in the HUD but no moving death dot. A small horizontal bar will appear above the pipper when you are within range of your target. Each time you press the [Spacebar], you fire a rocket.

E-O (Electro-Optical)

This mode is used with the AGM-65B TV-guided Maverick missile and GBU-15 guided bomb. Cross hairs appear in both the HUD and the REO when you select either of these weapons. The cross hairs on the HUD will automatically lock onto targets within range. When either of these weapons locks on to a target, the cross hairs will move on the HUD and a magnified image of the target will appear in the REO. You can manually switch targets by pressing the [T] key. Fire the missile or guided bomb by pressing the [Spacebar].

Once you're locked on and fire the weapon, it is self-guiding. You can lock on to another target without worrying about your previous missile. A distance-to-target readout will also appear on the HUD above the waypoint readout, showing your distance in feet to the locked-on target.
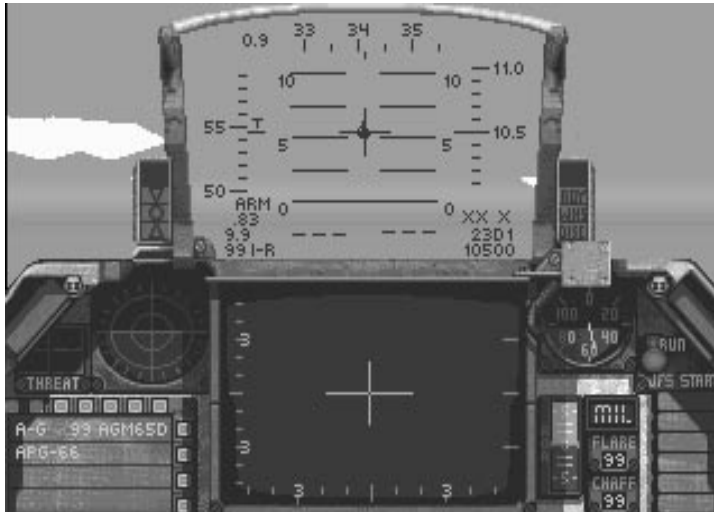
A-G (Air-to-Ground)

This HUD mode is used for the AGM-45A Shrike and AGM-88A HARM anti-radiation missiles. These missiles will detect the radar emissions of a ground SAM or AAA site and lock on to its radar. Then they follow the radar beam in and destroy the site. These weapons operate like the Maverick missile. They are fire-and-forget — once you've fired them, they are self-guiding.

The difference between them is that the Shrike missile will only lock on to a continuous wave radar whereas the HARM missile will lock onto either a pulse-doppler radar or a continuous wave radar.

I-R (Infrared)

This HUD mode is used exclusively for the AGM-65D infrared-guided Maverick missile. This missile is similar to the AGM-65B TV-guided missile except it uses infrared light to track and lock on to its target. It operates identically to the E-O HUD mode weapons.

DUR (Durandal)

This HUD mode is used exclusively for the BLU-107/B Durandal anti-runway demolition bomb. It operates exactly like the CCIP mode.

STRF (Strafe)

This HUD is only used for the M61A1 cannon when you are trying to shoot at ground targets. It has a pipper that moves around the HUD. Its speed varies depending on your angle of flight. Bullets from your gun will travel toward this pipper.

ILS HUD mode

The ILS (Instrument Landing System) HUD mode is a non-combat HUD mode used as an aid in landing. It is particularly useful in bad weather or at night. While you won't run into bad weather in *Falcon 3.0,* you will want to rely on the ILS during night landings. The ILS only works on runways that are equipped with an ILS transmitter. Not all runways have an ILS system. If a runway doesn't have ILS, you will have to rely entirely on your eyes for landing. Of course, you can always turn on the autopilot and let your F-16 land itself, but no self-respecting Viper driver would do that under normal circumstances!

Call up the ILS HUD mode by pressing the ⬚ key.

The ILS works by projecting a beam along the runway. The beam is picked up by the F-16, and your relationship to this beam is reflected on the ILS needles on the HUD. The two scales, represented by the needles, are the Localizer Deviation Bar and the Glide Slope Deviation Bar.
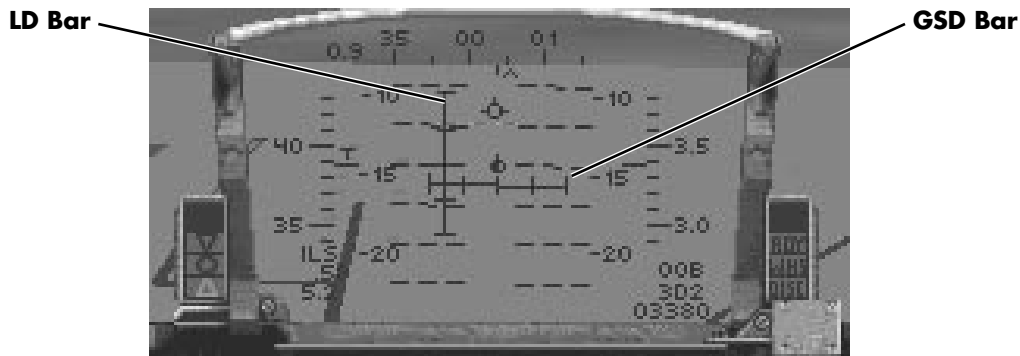
The Localizer Deviation (LD) Bar is the vertical bar that indicates whether you are to the left or right of the runway. This bar is always vertical but will move to the right or left. It moves in the direction that you need to go in order to line up with the runway. For example, if the LD Bar is to the right of the HUD, the runway is to your right. When you steer to the right, the LD Bar will move toward the center of the HUD.

The horizontal bar is the Glide Slope Deviation (GSD) Bar. It indicates if you are above or below the optimal glide path. The GSD bar is always horizontal but will move up or down the HUD. If it is above the Center Point of the HUD, then you are above the recommended glide slope and should lower your nose. As you descend, the GSD Bar will drop towards the center of the HUD.

When both scales form a perfect cross in the center of the HUD, you are "on the beam." "Fly the needles" by steering in the direction of the intersection of the two needles.

If you are off the Localizer by more than 45°, the ILS needles will be displayed as dotted lines.

For more information on landing, see Lesson 4 in **Section VI: Air Combat School** or see the detailed instructions on landing later in this section.

Directional vs. Beacon

The ILS has two modes: Directional and Beacon. Pressing ⟨\⟩ turns on the ILS; ⟨Shift⟩⟨\⟩ toggles between the two modes. In both ILS modes, the correct heading for the final approach to the runway located at your LAND waypoint is displayed in the lower right-hand corner of the HUD (on top of the stack of numbers). In Directional mode, this heading is followed by the letter "D"; in Beacon mode, the heading is followed by the letter "B".
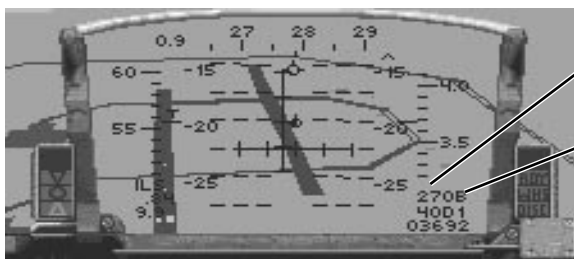
Approach Heading

Mode Designator

ILS Beacon Mode

In the Beacon mode, the ILS locks onto a radio beacon at the end of this runway. The beacon is omnidirectional so centering the localizer deviation (LD) bar will steer your aircraft directly for this point from any direction. The glide slope indication will only be valid if you are approaching the runway on the indicated heading. The Beacon mode is helpful for finding the runway and making the first pass of a racetrack landing, but it is not the best mode to use on the final approach.

The Directional mode is used to make the final approach to the runway. Lining up the GSD (glide slope deviation) and LD bars will put your aircraft on a 3° glide slope right down the middle of the runway. If the needles are not lined up, steer your aircraft towards them. Do not turn more than 90° off your approach heading, however, or you might end up flying in circles.

ILS view shift

When the ILS HUD mode is turned on, the view out of the cockpit is shifted downward so that you can more easily see the runway when your aircraft has the high angle of attack proper for landing. Another smaller downward shift occurs when the landing gear are lowered. Both view shifts can be toggled off and on with ⟨Shift⟩⟨Scroll Lock⟩.
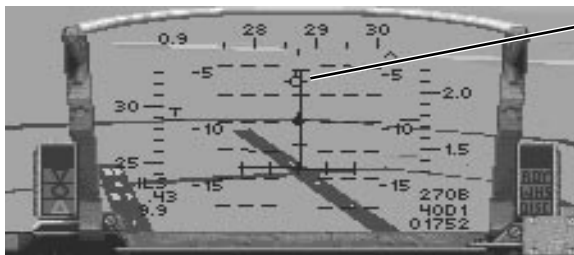
Center Point

Downward view shift (note position of the HUD Center Point)
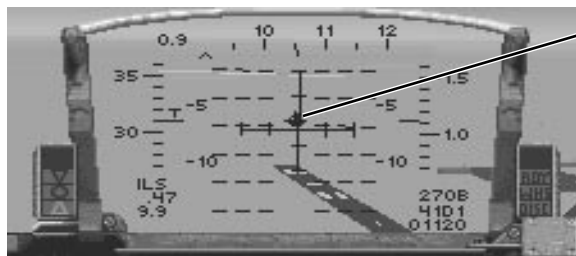
Center Point

Normal view

Front/Left/Rear/Right/Up Views

Five views are available from the inside of the cockpit: Front View, Left View, Rear View, Right View and Up View. Each view (except Up View) has an upper view and a lower view. The upper view generally gives you a better view outside the cockpit — useful when you need to track an enemy visually. The lower view will let you see important instruments and controls inside the cockpit. Toggle each view between upper and lower by pressing the Scroll Lock key. Each side view can independently be up or down. For example, you may look out the right side in upper view, hear a caution message from your Voice Message System, and then press the Scroll Lock key to look at the lower Right View so that you can see your caution lights. Switching the Right View to lower doesn't affect the state of the views in any other direction. If the left side view was in upper view, it remains in upper view until you explicitly change it.

Front View

Press the 3 key (or 1 on the numeric keypad) to switch to the Front View. The Front View contains the most important instrumentation in your F-16, including the HUD, REO Display and the Threat Warning System. In combat, you will want to refer to this view to obtain better situational awareness.

AR/NWS Status Indicator

RPM Indicator

Stall Light

JFS System

Mil/AB Indicator

Aircraft Status Control Panel

Master Caution Light

LCK Light

LNH Light

Threat Warning Indicator

Stores Control Panel

AOA Indicator

Chaff/Flare Indicator
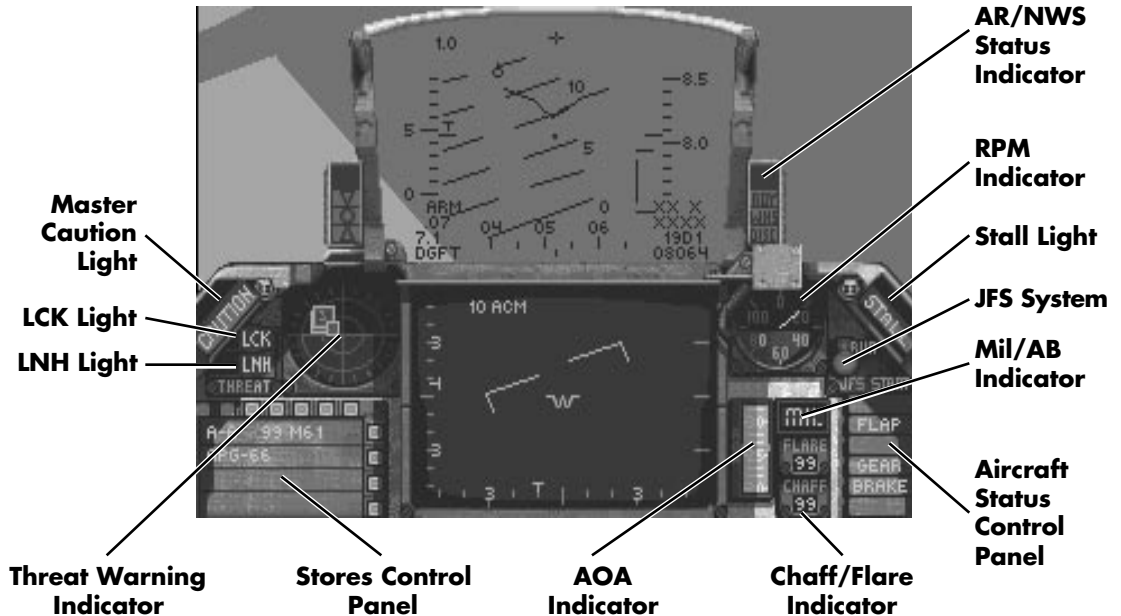
When you look up the Front View with the [Scroll Lock] key, the HUD remains in view but the REO and other lower cockpit instruments are not visible. However, you can see an area above the HUD that was not visible before. This view is very good for following enemy aircraft that are within visible range, particularly if you are on their six in a tight turn.

Master Caution Light

When this light is illuminated, it indicates that your aircraft has been damaged. You should immediately look to the Right View to see which caution lights are lit. See the Caution Light Panel section for more details on what these lights indicate.

Threat Warning System

The Threat Warning System warns you of incoming threats to your aircraft. Its two primary warning instruments are the Threat Warning Indicator and the Threat Warning Panel.

Threat Warning Indicator

The Threat Warning Indicator displays the relative location of nearby radar emitters (enemy aircraft, SAMs, radar-guided missiles) to your F-16. The indicator is arranged in a 30-mile-radius god's-eye view, with the nose of your plane facing "up" the screen. Any blips that appear in the top hemisphere of the screen are in front of you, and any that appear in the bottom half are behind you. Likewise, blips to the right are to your right and vice versa. Blips toward the center of the TWI, however, are stronger radar signals while blips toward the outer edge are weaker radars.

This is a passive receiver system and only illuminates if an enemy radar is directed at you. However, when you are in SAD radar mode, you will see every aircraft within 30 miles on your TWI, whether they are painting you or not.

Three different types of blips can appear on this screen.

- ⚔ Diamond – an enemy aircraft is within 30 miles of your present location.
- ⚔ Large green square – a radar installation within 30 miles is painting you with its radar.
- ⚔ Small green square – an active-homing radar-guided missile has been fired.

You will see a number within the TWI blip. This indicates the type of radar that is painting you. The radar types and their corresponding numbers are:

Air-to-air radar

Number	Radar Type
1	Multiple tracking, look-down shoot-down radar
2	Single target tracking radar
3	Continuous wave radar
4	Targeting radar
5	Attack radar
6	Early warning (EW) radar

Ground-to-air radar

Number	Radar Type
1	Short-range continuous wave SAM
2	Short-range pulse-doppler SAM
3	AAA
4	Long-range pulse-doppler SAM
5	Long-range search
6	Long-range multipurpose chirp

Threat Warning Panel

This display, located in the upper left-hand corner of the instrument panel, displays two lights essential to the health of you and your F-16. These are the Lock-on (LCK) and Launch (LNH) lights.

The Lock-on (LCK) Light tells you when an enemy plane or missile has achieved a radar lock on your plane. It will illuminate and will also be accompanied by a high-pitched audio cue. When you see this light, check the Threat Warning Indicator to see whether you have a SAM or radar-guided missile chasing you. It is highly recommended that you activate your ECM pod (if available) and initiate evasive maneuvers to shake the lock.

If the Launch (LNH) Light flashes, it means that an A-A missile or SAM (either shoulder-launched or truck-mounted) has been launched. The Threat Warning Indicator and your eyes will tell you what direction the threat is coming from. As with a lock-on, you should immediately activate ECM and fly unpredictably to shake the incoming SAM or A-A missile.

AOA (Angle of Attack) System

The F-16's Angle of Attack (AOA) System is primarily used in conjunction with the Instrument Landing System (ILS) as an aid in landing the plane. Proper AOA is essential for landing, so these gauges are invaluable when approaching your runway.

The AOA System consists of two gauges: the AOA Indexer and the AOA Indicator.

AOA Indexer

This gauge, just on the left side of the HUD, indicates how you should fly your plane so you have the proper angle of attack (landing approach angle) to the runway. It consists of three lights that graphically display your AOA:

When the top light is lit, your AOA is too high because your airspeed is too low.

When the middle light is lit, your AOA is appropriate for landing.

When the bottom light is lit, your AOA is too low because your airspeed is too high.

AOA Indicator

This gauge, located just to the right of the REO, duplicates the AOA Indexer's function but displays your F-16's angle of attack in numerical format. This allows you to be more precise in your AOA calculations. An AOA of 10°–13° is necessary for landing your plane.

You can find instructions on landing your F-16 later in this section.

Stores Control Panel (SCP)

The SCP is the pilot's indicator of what weapon is currently loaded and available to fire. To change weapon selection, press either the [Backspace] key to select one of the air-to-ground weapons or the [Enter] key to select one of the air-to-air weapons.

The first line in the SCP indicates what general type of weapon you have loaded (either "A-A" or "A-G" for air-to-air or air-to-ground respectively), then the number and type of that weapon. The number and type of weapon that is displayed is dependent on what weapons were loaded onto your aircraft before takeoff. However, regardless of your weapon choices, you will always have your built-in M61A1 cannon.

The second line in the SCP indicates whether you have your radar turned on or not. If the letters "APG-66" are *not* displayed on this second line, your radar is either turned to Standby or it is inoperable. To turn the radar back on (if not damaged), press the [R] key.

If you want to see a list of the weapons you have on board, press the [V] key repeatedly to cycle through the complete armament stores on your F-16.

If you want to jettison some of your stores, press [Ctrl][K] to jettison all stores except for wingtip missiles and the ECM pod. Press [Ctrl][F] to jettison all external fuel tanks (both centerline and wing), and press [Ctrl][C] to jettison only the ECM pod. Remember: "F for fuel, C for countermeasures."

Air Refuel/Nose Wheel Steering (AR/NWS) Status Indicator

Located just to the right of the HUD, the AR/NWS Status Indicator consists of three lights:

RDY (Ready) Light
The RDY Light comes on while you are on the ground and indicates that your landing gear is operational and not damaged. This light will remain on as long as your gear is undamaged or until you retract your landing gear.

AR/NWS (Air Refuel/Nose Wheel Steering) System Light

This light, which is displayed as "WHS," illuminates to indicate that your F-16's NWS System is activated and operational. When the light turns on, this means that command has been switched from the ailerons to the nose wheel so that your plane can taxi out and steer on the runway. As you initiate the JFS System, the NWS System will be activated. While on the ground, you steer with the rudders.

At 70 kts ground speed, the AR/NWS System Light will go out. This indicates that control has been given to the ailerons. The NWS System will not actually disconnect until the plane is airborne, when the Disconnect (DISC) Light illuminates.

DISC (Disconnect) Light

The DISC Light will turn on as soon as your F-16 has left the ground. It indicates that the NWS System has been disconnected and that control of the plane has been returned to the ailerons, so the plane can maneuver from side to side. This light will remain on until the landing gear has been raised.

This indicator also serves as a reminder to raise your landing gear with the ⒢ key.

NOTE: Never exceed a ground speed of 200 kts with the landing gear down or your Nose Wheel System and your aircraft will suffer severe damage.

RPM Indicator

The RPM Indicator displays the percentage of thrust you are currently applying to your F-16's engine. You can increase or decrease this percentage by using the ⊞ and ⊟ keys respectively. When in the Simplified flight model, this percentage is directly related to your speed in knots (displayed on the HUD). In the other flight models, your true air speed (TAS) is modified by lift, drag and atmospheric conditions.

When initiating takeoff, your F-16 will begin to roll at 40% RPM and you should disengage the Wheel Brakes at approximately 60% RPM by pressing the ⓦ key. Delaying this release could cause damage to your NWS System or your Wheel Brakes. Increase thrust to 100% for takeoff and invoke the afterburner (with the ⧄ key) if your aircraft is carrying a heavy payload. You can find more information about takeoff later in this section.

The terms "RPM" and "thrust" can be used interchangeably.

Jet Fuel Starter (JFS) System

The JFS System consists of two lights that display the current condition of the F-16's engine.

JFS Run Light

The JFS Run Light will turn red and remain lit as long as the engine is engaged. If your engine is destroyed in battle, this light will turn green — but you'll have more important things to worry about than this light.

JFS Start Light

The JFS Start Light turns red upon primary ignition of the engine (when you initially press the ⊞ key while on the runway). The light will remain red until the F-16 reaches 60% RPM, when the light will turn green (off) and the main engine takes over. It will remain off during normal operation of the airplane, even if the plane drops below 60% RPM. The only time the light will illuminate (red) again is if the engine is shut off (0% RPM) and then restarted.

Stall Light

When the Stall Light (located near the upper right edge of the glareshield) turns on, it indicates that you have a stall condition present. Any number of things could have brought on the stall, but the most likely reason is that there is not enough airflow passing under your wings. This is usually caused by two conditions: sharp maneuvers at high altitudes where there is less air or flying with your airspeed too low. The best way to recover from a stall is to nose forward into a dive until you recover enough airspeed to resume normal flight. Be sure you have enough altitude for this maneuver.

Military Power/Afterburner (MIL/AB) Indicator

This display indicates whether you are using Standard Power (MIL) or Afterburner (AB).

Standard Power is any normal power produced by the engine from 0%–100% RPM. The term for reaching 100% thrust (when not in Afterburner mode) is known as Military Power. When in Standard Power mode, this MIL/AB Indicator will display "MIL."

Afterburner is a form of super acceleration utilized primarily for increased speed during takeoff and dogfighting. It is achieved by injecting fuel into the jet exhaust, which is subsequently ignited by the high temperature. You can light your afterburner by pressing the ⃞ / key. This will bring you to 100% RPM and then engage the afterburner. The MIL/AB Indicator will now display "AB1," indicating that your plane is in afterburner stage 1. There are five different afterburner stages ("AB1" through "AB5"), each higher stage increases speed by pouring more fuel into your F-16's jet exhaust. You can increase and decrease the afterburner stages by pressing the ⃞ > and ⃞ < keys respectively. To drop out of afterburner back to 100% Military power from any afterburner stage, press the ⃞ / key again.

REMEMBER: Your afterburner uses an enormous amount of fuel, so be sure to keep your eye on the fuel gauge (Left Lower View). In addition, the afterburner is a favorite attraction of heat-seeking missiles, so don't light your afterburner if you have one on your tail.

Chaff/Flare Indicators

These indicators keep track of the number of chaff packets and infrared flares you have remaining on board. Chaff and flares are used to divert radar tracking and heat-seeking missiles. Your F-16 is always initially equipped with 30 packets of chaff and 30 flares.

Chaff Indicator

This indicates the number of chaff packets you have left to use. Chaff are packets of tiny pieces of foil designed to fool radar-guided SAMs and radar-guided A-A missiles. They operate by deflecting radar waves aimed at your aircraft. To dispense a packet of chaff, hit the ⃞ Ins key (or ⃞ 0 on the numeric keypad).

Flare Indicator

The Flare Indicator tells you how many infrared flares you have remaining. Flares are designed to confuse heat-seeking missiles since they produce a hot infrared source that attracts those missiles away from your plane. To drop a flare, press the ⃞ Del key (or ⃞ . on the numeric keypad). Remember that using your afterburner creates a tremendous amount of heat, so dropping flares with your afterburner on will not be very effective.

Aircraft Status Control Panel

A number of lights on the right-hand side of the Front View remind the pilot about the current status of his aircraft.

ECM Status Light

The ECM Status Light toggles on when you engage your ALQ-131 ECM (Electronic Countermeasures) Pod by pressing E. Since the ECM pod is an optional piece of equipment, it will only be present if you request it when loading your weapons. The ECM pod is used to foil ground-based radar, SAMs and the on-board radar of enemy aircraft. Because ground and air-based radar can pick up ECM emissions, you should only use ECM when an enemy aircraft or a SAM has acquired a lock on your plane.

Remember that your ECM pod is not 100% effective as it has to continually battle fire control radars. If your F-16's ECM pod is activated, you will still get locked up on radar but sometimes only for a few moments. Likewise, if you are tracking a plane that uses ECM, your radar lock will be broken and reestablished multiple times as your fire control radar systems battle the target's ECM.

FLAP Status Light

The Flap Status Light lights up when the wing flaps have been engaged using the F key. The wing flaps are used to slow the F-16 down while landing. You can also use the flaps in conjunction with the speed brakes (see the Brake Status Light) to help reduce speed.

WARNING: Never lower your flaps at speeds over 400 kts. This will cause your flaps to become permanently inoperative.

AUTO Status Light

The Auto Status Light illuminates when you engage the automatic pilot (autopilot) by pressing the A key. The autopilot will then immediately begin to follow the flight route you set when planning your mission. Your plane will also instigate the specific waypoint action ("LOITER," "ESCORT," etc.) that you set on the flight route.

If there are enemy planes in the immediate vicinity, however, your plane will attempt to engage the nearest aircraft targeted on your REO. (To change the targeted aircraft, press the T key.) It will even fire a missile if it obtains a missile lock on an enemy aircraft. Of course, any true-blue Falcon pilot won't use the autopilot in actual combat.

GEAR Status Light

The Gear Status Light turns on when the landing gear on your F-16 is in the down position. Press G to lower the gear. Immediately after takeoff, you should always raise the landing gear by pressing the G key again. Failure to do so could cause serious damage to the landing gear and may force you to make a belly landing. Your landing gear should only be lowered when approaching the runway at a slow speed. You can confirm that the gear is down by looking at the Landing Gear lights in the left lower cockpit view.

BRAKE Status Light

The Brake Status Light turns on when you utilize the speed brakes by pressing the B key. The speed brakes are used to temporarily slow the plane while still keeping the same amount of thrust on the engine. The brakes are useful when engaging enemy planes

because you can use them to slow you on certain maneuvers, then regain your original speed within seconds. You can also use the speed brakes in conjunction with lowering the throttle to help land the plane. Pressing the ⊞ key toggles the speed brakes on and off.

WL BRK Status Light
The Wheel Brake Status Light toggles on when you engage the wheel brakes by pressing the ⊞ key. The wheel brakes are used to slow you down during landing and anchor the plane after landing when it has finished rolling on the runway.

Left View

Press the ④ key (or ⑦ on the numeric keypad) to change to the Left View. The lower Left View contains a number of important gauges and lights which you can use if you have HUD failure or require specific information not found on the Front View.

Fuel Indicator

The Fuel Indicator shows you how much fuel you have remaining in both the internal tank and any external tanks you may have loaded prior to takeoff. This gauge is measured in hundreds of pounds of fuel. Check this indicator periodically to ensure you have sufficient fuel for your current mission. In addition, if the word "FUEL" appears on your HUD, check here *immediately* to determine how much fuel you have remaining. If you have very little fuel left, you may have to abort your mission and return to your air base.

Fuel will be drawn from any external fuel tanks first, as indicated by the long hand on the indicator. The smaller hand corresponds to your internal fuel tank and will not move until you have exhausted all the fuel from your external tanks. The internal tank holds approximately 6,950 pounds of fuel while the capacity of external tanks depend on what size tank(s) you have loaded on.

Landing Gear Lights

These three lights illuminate when you have your landing gear down. If you press the ⒢ key and these lights do not turn on, your landing gear has been damaged and you will have to attempt a belly landing. The most common way for the landing gear to become inoperable is because it was not raised upon takeoff and thus broke during high-speed maneuvers.

Airborne Video Tape Recorder (AVTR) Panel

The AVTR Panel allows your F-16's on-board video to record your combat action for later review. Complete details about the AVTR and the Air Combat Maneuvering Instrumentation (ACMI) pod can be found in **Section XI: ACMI**. The AVTR Panel consists of two indicators: the AVTR Status Light and the AVTR Tape Indicator.

AVTR Status Light

When the AVTR Status Light is on, you are recording replay data to your AVTR. You can turn the AVTR on and off by pressing Ctrl R.

AVTR Tape Indicator

This green bar is located below the AVTR Status Light and is used to indicate how much time you have left on your continuous replay. The bar will tick down from right to left when you turn on the AVTR. If it reaches the far left, the tape is full and any new data recorded will overwrite the beginning of your replay. You need expanded memory in order to use the AVTR. If you don't see the green bar in the AVTR Tape Indicator, you will not be able to record flight data.

Backup Airspeed Indicator

The Backup Airspeed Indicator shows your current airspeed in tens of knots. You can use this gauge to monitor your airspeed if your HUD gets knocked out in combat.

IFF Light

The IFF (Identification Friend or Foe) gives you a visual cue as to whether or not the plane you've got a radar lock on is a friendly or an enemy. Press the Ⓝ key, and if the light illuminates, the aircraft you've locked onto is a friendly. After about 10 seconds, the IFF Light will turn off. If you have your sound turned on, this light will be accompanied by a high-pitched squawk.

Compass

The Compass gives your current heading and complements the Heading Scale on the HUD. It measures your heading by compass point rather than degrees where N(orth) is 0°, E(ast) is 90°, S(outh) is 180° and W(est) is 270°. Use the compass to check your heading if your HUD has been knocked out by enemy fire.

Right View

Press the $\boxed{6}$ key (or $\boxed{9}$ on the numeric keypad) to look at the Right View. The lower Right View displays the on-board Clock and the Caution Light Panel. If the Master Caution Light on the Front View illuminates or you hear your Voice Message System (VMS) say "WARNING" or "CAUTION" repeatedly, check the Right View to see which system(s) have been damaged.

Clock

The clock is an analog display of the present game time (as compared with real-world time). Missions start at certain times and the clock will let you know what time of the day it is in the simulation. The dial is displayed in standard 12-hour mode.

Caution Light Panel

One or more of the 14 caution lights will illuminate if your aircraft sustains damage. Each of these lights indicate that the system in question is inoperable and will require repairs when your plane has touched down at your air base.

FLAP Caution Light

The Flap Caution Light indicates that your wing flap mechanisms have been damaged and are frozen in their current state. If your flaps were open (i.e., the Flap Status Light was on) prior to the damage, your flaps will be stuck in that position. Your plane will have less maneuverability and will be unable to achieve maximum velocity. If the flaps were frozen in the closed position, your plane will be harder to land.

Recommended action: Land as soon as practical if you have suffered other major damage. It is possible to fly with this system inoperable, but it is not recommended.

FUEL SYS Caution Light

When the Fuel Sys Caution Light illuminates, it indicates that you have a leak in your fuel system. This light only informs you that there is a leak, but not the severity of that leak. Check the Fuel Indicator on the Left View and monitor the amount of fuel that is being lost. If the leak is severe, you may be forced to turn home or land immediately.

Recommended action: Land as soon as practical, especially if you have taken other damage. Use your best judgment; if the fuel leak is slow, you may be able to continue with your mission. However, if you notice the amount on your Fuel Indicator decreasing quickly, you may be forced to land your plane immediately (on a road or flat surface) or eject from your plane.

STORES Caution Light

The Stores Caution Light indicates that you are unable to launch or jettison any external stores you have loaded on your F-16. This includes all A-A and A-G weapons, external fuel tanks and ECM pods. If you are planning on engaging enemy aircraft, you will need to switch to your M61A1 cannon.

Recommended action: Because this damage affects all of your weapons (save for your internal gun), it is recommended that you return to base or assist your wingman in completing your mission if you have not completed the mission. If you have already completed your assigned mission and are nearly home, this light is not as crucial.

ENGINE Caution Light

The Engine Caution Light indicates that your engine has been damaged beyond repair. Engine shutdown causes your engine to drop to 0% RPMs, and your airspeed will begin to decline. Once you obtain a low enough airspeed, your plane will drop into a flat spin.

Recommended action: Engine damage is the most severe type of damage your plane can incur. If you are at a low altitude, you may want to try to "dead-stick" land the plane. If you do try a dead-stick landing, you'll only have one chance at it. Your best course of action when the engine shuts down is to level the plane out, then immediately eject (by pressing Ctrl E three times).

BRAKES Caution Light

The Brakes Caution Light indicates that your speed brakes have been damaged and are stuck in their current position. If your speed brakes were open (i.e., the Brake Status Light was on), your speed brakes will be frozen in that position. Since speed brakes are used to reduce velocity, your plane will be less maneuverable and you will be unable to accelerate to top speed. If your speed brakes are stuck in the closed position, your plane will be more difficult to land.

Recommended action: Land as soon as practical if you have suffered other major damage. It is possible to fly with this system inoperable, but it is not recommended.

BURNER Caution Light

When the Burner Caution Light illuminates, it indicates that your burner has been damaged and is no longer operational. Your plane will immediately drop from any afterburner stage it was in previously to 100% standard power (MIL). Afterburner damage means that you will have a difficult time escaping from an area quickly or completing high-speed maneuvers.

Recommended action: If you feel you will need to use your afterburner on your mission, you may wish to return to your airfield and have the damage repaired. Otherwise, you can continue with your mission if you feel you won't need your afterburner.

HUD Caution Light

The HUD Caution Light will come on when your HUD has been completely knocked out. Your viewscreen will no longer display any HUD information, so you must rely on the secondary instruments in the Left View. When your HUD goes out, you have very little information on your plane's current status (altitude, degree of climb or dive, etc.). Other than engine damage, this is the most serious form of damage your plane can take.

Recommended action: Land as soon as possible to make repairs. Your plane is not totally useless, but without the vital HUD information, your plane will be nearly crippled in a dogfight. Landing will also be difficult since you will no longer have the ILS HUD to guide you down your runway.

OXY LOW Caution Light

The Oxy Low Caution Light illuminates when enemy gunfire pierces your canopy. This damage causes a drop in cabin pressure and will limit your maximum ceiling to 20,000 feet. Flying above this ceiling will cause you to blackout, even if you are flying straight and level.

Recommended action: If you are above 20,000 feet when this damage occurs, pull into a dive immediately and drop below this ceiling. If you are engaged in a dogfight, be sure not to cross this ceiling. In addition, high-speed, high-G maneuvers can cause you to blackout at lower Gs than normal. It is recommended that you return to base as soon as practical to make repairs.

GUN JAM Caution Light

The Gun Jam Caution Light indicates that your M61A1 cannon is jammed and no longer functional. When this light illuminates, only your internal gun is damaged; any remaining stores (both A-A and A-G) are not affected. You will need to switch to your other weapons (if you have any remaining) for combat purposes.

Recommended action: Because this damage does not affect your missiles or bombs, it is not as severe as when the Stores Caution Light or the Wep Arm Caution Light comes on. You only need to land if you plan to engage in a dogfight and your A-A missiles are expended.

WEP ARM Caution Light

The Wep Arm Caution Light illuminates when your arming mechanism has been hit and is no longer functional. This means that you will be unable to arm *any* A-A or A-G weapons. Any cluster bombs, iron bombs and rocket launchers will still operate properly. However, you will need to switch to your M61A1 gun for a dogfight or strafing.

Recommended action: This damage severely hampers your ability to dogfight and to complete an A-G mission. If you are currently on a mission requiring A-G missiles, you will need to either head for home or attempt to cover your wingman. Usually, the best action is to land at your airfield as soon as practical to make repairs.

RADAR Caution Light

The Radar Caution Light turns on when the radar display of your REO is no longer operational. You will no longer be able to achieve a radar lock on A-A or A-G targets and will be unable to determine the exact position of enemy aircraft and ground targets. Heat-seeking missiles will still have the ability to lock-on, however. In addition, you will need to rely on the Pitch Ladder of your HUD to orient yourself to the horizon. You will still be able to navigate because this does not affect the map display of your REO.

Recommended action: If your mission requires you to destroy a ground target, this is still possible but only through visual sighting and release of your weapons. Air-to-air combat is much more difficult because you have lost the ability to use any radar-guided missiles. If your mission is to fly CAP and you have little or no M61A1 ammo remaining and no heat-seeking missiles, the best decision is to land as soon as possible.

NWS Caution Light

The NWS Caution Light will come on when your Nose Wheel Steering System has been damaged. There are three typical causes for this damage: not following required takeoff procedures (i.e., not raising your landing gear upon takeoff), landing too hard on the runway and being hit by enemy gunfire. When the NWS System is damaged, you will have a difficult time steering the plane once it has landed on the runway. This could lead to more severe damage and increased repair time if the plane manages to roll off the runway.

Recommended action: Although this damage is major when you are attempting to land, it does not affect the handling or performance of your F-16. Because of this, it is not necessary to land for repairs right away. Just be sure to remember that this damage has occurred when you are preparing to land and try to touch down as smoothly as possible.

ECM Caution Light

The ECM Caution Light will illuminate when your ALQ-131 ECM pod has been destroyed by enemy gunfire. You will no longer be able to engage your ECM pod to spoof enemy missiles and radar. If you did not load an ECM pod before takeoff, this light will not turn on.

Recommended action: If your mission involves attacking a SAM site or a heavily guarded air base, you may want to abort your mission and return to base for repairs. However, you may feel that you can accomplish your mission without an ECM pod.

NAV Caution Light

The Nav Caution Light will light up if the map display on your REO is no longer operational. In addition, you will be unable to see the Waypoint Caret on the HUD. Without the map, you will have to rely on visual spotting of terrain features to determine your position in the area; however, you will still be able to use your autopilot to fly you to your waypoints. In addition, you will still be able to lock onto targets and determine their position if the radar display of your REO is still functioning.

Recommended action: If you have only a few waypoints set prior to initiating your mission, the loss of the REO's map display will be minor. This is because you can engage your autopilot to follow your planned route in and out of the target area.

Rear View

Press the ⑤ key (or ③ on the numeric keypad) to switch to the Rear View. No lights or gauges are available in this view, but it is useful for scanning your rear for enemies.

Up View

Press the Ⓤ key to switch to Up View to give you another angle to view the action if you are inverted or trying to scan a plane flying overhead. No instruments are in this view, and it is difficult to fly in for prolonged periods of time.

Voice Message System (VMS)

In addition to the displays and indicators on the various instrument panels, the F-16 has another system to warn the pilot of impending danger. This is the Voice Message System (VMS), affectionately known as "Bitchin' Betty." The VMS uses a female voice to warn the pilot about hazardous conditions. The VMS messages are listed below by priority:

- ♠ PULLUP-PULLUP-PULLUP-PULLUP – This message is activated if you are in immediate danger of crashing into the ground. Usually this involves diving toward the ground with a large angle of descent or high airspeed. In addition to the audio cue, your HUD will display two "arrowheads" rapidly converging towards the center. The closer the arrowheads are to each other, the closer you are to the ground. If the arrows flash, it indicates immediate danger. This VMS warning will silence when you take action to correct this problem (i.e., pulling back on the stick to correct your descent angle).

- ♠ WARNING-WARNING (pause) WARNING-WARNING – This message is activated after any warning light illuminates on the glareshield. It usually means a major failure has occurred in your aircraft (such as an engine failure).

- ♠ CAUTION-CAUTION – This message comes on after the Master Caution Light illuminates. Its intent is to inform you that one of the Caution Lights has lit up on the Right View. Once you look at the Right View, this message will silence.

Wingman messages

You will hear messages from your wingman, other allied pilots and from the AWACS plane during a campaign or Red Flag mission. Sometimes they are in response to an inquiry or command from you; other times they just let you know what they are doing. These messages only come from the other pilots in your flight and indicate actions and observations from your wingmen.

You will only hear these messages if you have expanded memory and are using a Sound Blaster card, an Ad Lib card or the IBM PC speaker.

This is a list of some of the messages you may hear and what they mean.

- ♠ Waypoint x at xxx - Angels xx - xxx miles – From AWACS. This message describes the number of the next waypoint, the direction to that waypoint, the altitude you should be at ("Angels") and how many miles away the waypoint is. (Since this is a generic AWACS message, the digitized speech sample is intentionally garbled to sound like radio static.)

♣ Negative. Pigeons to home plate – From AWACS. You have tried to advance your waypoint past the last setting (your home base).

♣ Kilo Mike Alpha – A message from your wingman if you ask him to do something really stupid, like "Break Low" when he is flying at 100 ft AGL.

♣ I've got a spike – Your wingman is detecting another plane or ground unit with its radar aimed at you.

♣ Stranger – An unexpected friendly aircraft is in the area.

♣ Unable – Unable to comply with your command.

♣ Copy fence check – Your wingman has made sure all his weapons and systems are ready for combat.

♣ Be advised, I've gone winchester – Your wingman is out of A-A/A-G weapons.

♣ Copy disengage, will resume – Will disengage and resume formation.

♣ Clean, clear, and naked – Nothing on radar, nothing visual and nothing on the Threat Warning Indicator.

♣ Fox one – Your wingman is firing an AIM-120 AMRAAM radar-guided missile.

♣ Fox two –Your wingman is firing an AIM-9P Sidewinder missile.

♣ Fox two mike – Your wingman is firing a AIM-9M Sidewinder missile.

♣ Atoll! Atoll! – A rear-aspect heat-seeking missile has been fired at your wingman.

♣ Magic! Magic! – An all-aspect heat-seeking missile has been fired at your wingman.

♣ Apex inbound! – An Apex passive radar homing missile is inbound.

♣ Guns! Guns! Guns!– Your wingman is firing his M61A1 cannon.

♣ Flame out – Your wingman has been hit and has engine damage or is totally out of fuel.

♣ Bandit! Bandit! – Enemy aircraft sighted. This message is accompanied by info on the bandit's direction.

♣ Singer high! – A SAM has been launched.

♣ Request you check joker – Your wingman is running out of fuel and wants to let you know that you should be aware of your own fuel situation.

♣ Be advised. Fuel is low – Your wingman has only enough fuel to return to base. Any action other than returning to base could be cause for a flameout.

If you are getting overwhelmed by radio chatter, you can tell everyone to shut up by pressing Shift R.

Wingman commands

You can direct your wingmen to take several different actions during a mission.

✦ [Shift][A]   Tell wingman to break left. A break turn is a maximum G turn into an attacking bandit. Direct your wingman to break if you detect a bandit at his 6 o'clock closing into a firing position or if a missile is in the air.

✦ [Shift][D]   Tell wingman to break right.

✦ [Shift][W]   Tell wingman to break high.

✦ [Shift][X]   Tell wingman to break low.

✦ [Shift][S]   Tell wingman to fly straight and level.

✦ [Shift][F]   Tell all wingmen to close up formation. If you order your wingmen to close up, they will halve the distance between the planes in the flight.

✦ [Shift][G]   Tell all wingmen to spread formation. If you order your wingmen to spread out, they will double the distance between the planes (but not so far as to lose visual contact).

✦ [Shift][B]   Bypass current waypoint.

✦ [Shift][V]   Return to current waypoint.

✦ [Shift][R]   Tell all wingmen to keep radio silence.

✦ [Shift][Z]   Tell wingman to bracket left. Usually executed outside of 15 miles, a bracket is a pincer move to intercept a bandit formation from two sides.

✦ [Shift][C]   Tell wingman to bracket right.

✦ [Shift][E]   Tell wingman to engage. If you order your wingman to engage, he will enter a turning fight with the nearest bandit.

✦ [Shift][Q]   Tell wingman to disengage.

✦ [Shift][2]   Tell wingman to drag left. The drag is a maneuver designed to decoy the enemy and have him engage a fighter that is leaving the fight.

✦ [Shift][3]   Tell wingman to drag right.

✦ [Shift][N]   Ask AWACS for navigation information.
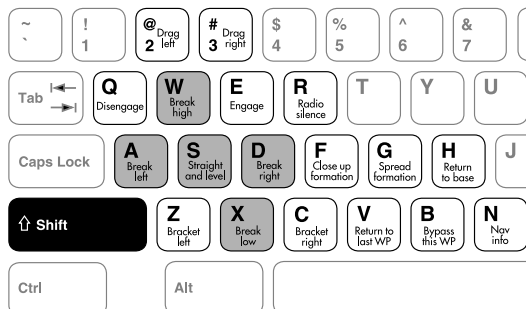
Radar/Electro-Optical (REO) Display

The F-16 uses the Westinghouse APG-66 pulse-doppler "look-down" radar for both air-to-air and air-to-ground detection of targets. This is a small, highly effective radar unit which give you significant advantages against an enemy that is closing on you at a distance. Since the real radar is quite complex to use, we give you three levels of radar simulation. (The three different radar types are options chosen in the Configuration area and not by a key in flight.) SAD mode is the simplest (and least realistic) mode and gives you a 360° view of all aircraft around you. SAM mode is more like the real Situation Awareness Mode found on the APG-66, but the operation is simplified. For those of you who want a real challenge, the HFR mode gets you close to the real thing. When you learn the HFR mode, you'll appreciate the skill required of a real F-16 pilot!

Situation Awareness Display – SAD

The radar images in SAD mode, as well as in the other modes, are displayed on the REO as long as your radar is turned on. You can verify your radar is on if the second line of the Stores Control Panel reads APG-66. If the radar is off (in Standby mode), press the ⓡ key. Pressing the ⓡ key while the radar is on toggles it to Standby mode.

SAD mode is extremely useful for good situational awareness. Situational awareness is the ability to create a mental image of all the threats in the 3-D environment. SAD mode gives you general information about each aircraft that appears on the radar. You can also select individual targets and receive more specific information about the selected target.

SAD mode gives you a "god's-eye" view of your world. Your position is located in the center of the radar display screen, and the radar displays the 360° world around you. Any airborne aircraft appear on the radar as green squares.

Radar Range — Target Altitude — Target Heading — Target Airspeed — Aspect Angle — Closure Rate — Target's Bearing — Target's Distance
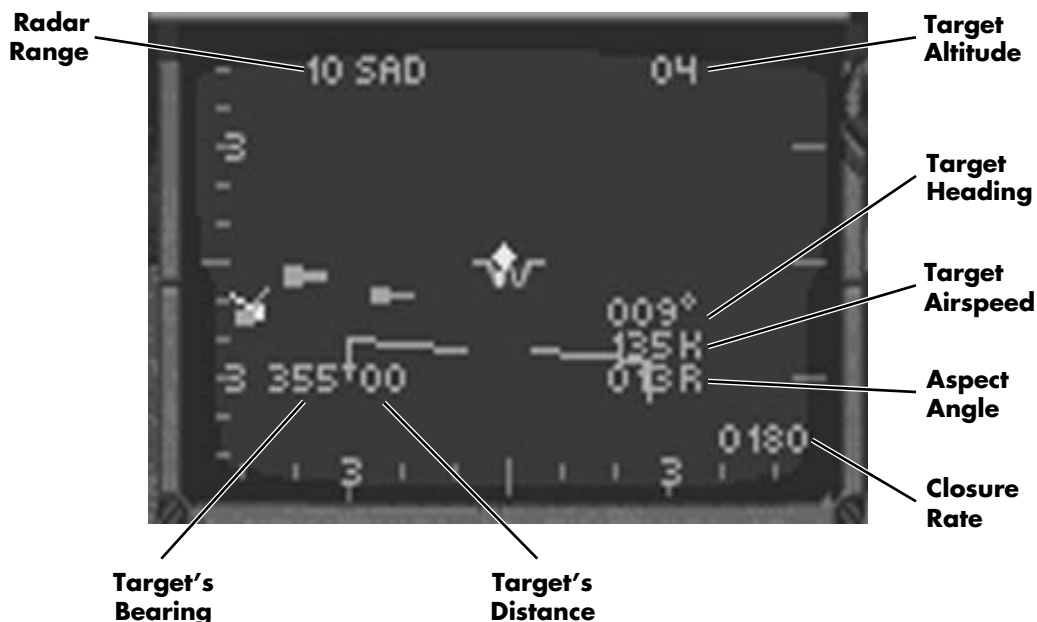
The radar range can be either 10, 20, 40 or 80 nm (nautical miles). In SAD radar mode, the Fire Control Computer will calculate the best range for you. The current radar range is displayed in the upper left edge of the REO. Immediately to the right of the range, you'll see "SAD" which is your radar mode. You will see every target that is in the air within the radar range you have set. For example, if the radar is at 20 nm distance, you will see every aircraft in the air within 20 nm. Aircraft more distant than 20 nm will not show up.

You can estimate the distance of each aircraft by its distance from the center of the REO. For example, if you are in 40 nm range, the radar covers a range of 20 nm in each direction from the center. A blip that appears halfway between you and an edge of the REO would be 10 nm from you in the direction he appears on the REO. If your distance range was set at 20 nm, a blip in the same position would be 5 nm from you.

The radar shows you approximate altitude data of every target displayed on your radar with a color code. An orange blip is more than 3,000 feet below you. A blue blip is more than 3,000 feet above you. A white blip is within 3,000 feet of you (either above or below).

SAD mode also tells you the approximate direction of travel of each target. You will see what appears to be a tail hanging off the end of each blip. If you think of it as a vapor trail coming off the back of the aircraft, you will easily be able to determine its direction of travel. Aircraft with their tails angling out away from the center of the REO are heading directly toward you.

The radar will automatically lock on to the closest target within the range selected on the radar. A target that is locked on to is displayed as a diamond. Other targets are displayed as small squares.

The REO has several readouts that give you information about the target that the radar has locked on to. The number in the upper right of the REO shows the altitude in thousands of feet of the current target. The number at bottom right shows your closure speed. It is negative if you are moving apart and positive if you are closing.

Above the closure speed readout is a readout stack of three numbers. The top number is the target heading in degrees, the middle number is the target speed in knots and the bottom number is the target's aspect angle.

On the left middle of the radar screen, you'll see two numbers indicating the selected target's bearing and its distance.

Other elements of the radar screen are the artificial horizon line that follows the movement of the horizon, and the radar elevation and azimuth scan bars. These are inverted Ts that move along the bottom and left edges of the REO, indicating the scanning of the radar dish. These are set automatically in SAD mode, so you don't have to worry about them.

You can easily lock on to other targets on your radar display by repeatedly pressing the T key. The radar will lock on to the next closest target and all the readouts update to display information about it.

Situation Awareness Mode – SAM

The Situation Awareness Mode radar is close to the SAM mode in the High Fidelity Radar model, but it is a bit easier to use. This is a very useful radar mode because it gives you a good overview of the combat arena and also allows you to get specific information on individual bogeys.

In SAM mode, the radar scans a cone 120° horizontally and 120° vertically in front of you. You will only see targets on your radar that are within this cone. The targets appear as green squares on the radar screen.

Like SAD mode, your radar range is automatically selected by your Fire Control Computer. The radar range is displayed in the upper left corner followed by the word SAM. Any target outside of this range will not appear on the radar screen. In SAM mode, your position is at the *bottom* of the radar screen. If you are in 40 nm range, a blip at the top of the screen is 40 nm from you. A blip in the center of the screen is 20 nm from you. SAM radar mode will auto-range if the target goes in or out of the current range. For example, if the radar range is set at 40 nm, when the target gets to about 20 nm (and appears at the bottom of the radar display) the radar will switch automatically to 20 nm range and the target will then be displayed at the top of the radar display. You can also toggle between the various radar ranges (10, 20, 40, 80 nm) with F8 or Shift F8.

The radar will automatically lock on to the closest target within radar range. A locked on target turns into a diamond. The SAM radar display has the same readouts as the SAD display with the following additions:

The left edge of the radar display has a grid with the number 3 above and below the center of the display. This is used in the HFR model to indicate the elevation scan of the radar, but this scan is not used in the SAM radar model. However, the upper half of the left edge is used as an altitude scale. The centerline of the scale represents ground level, and each tick represents 10,000 feet altitude. Therefore, the upper "3" represents 30,000 ft. You will see two horizontal lines drawn near this edge. These represent the altitude elevation range that is set automatically in SAM mode (you must set this range manually in HFR mode!).

The antenna azimuth and elevation markers in SAM mode look like little pyramids that move along the bottom and left edges. These represent the movement of the radar antenna during the SAM sweep. The inverted T along the bottom edge of the radar screen will be positioned under the current target. This is called the Tracked Target Marker, and it will move with the current selected target. Like SAD mode, the azimuth and elevation scans are preset and you don't need to worry about them.

Radar Range

Aspect Angle

Target

Locked Target
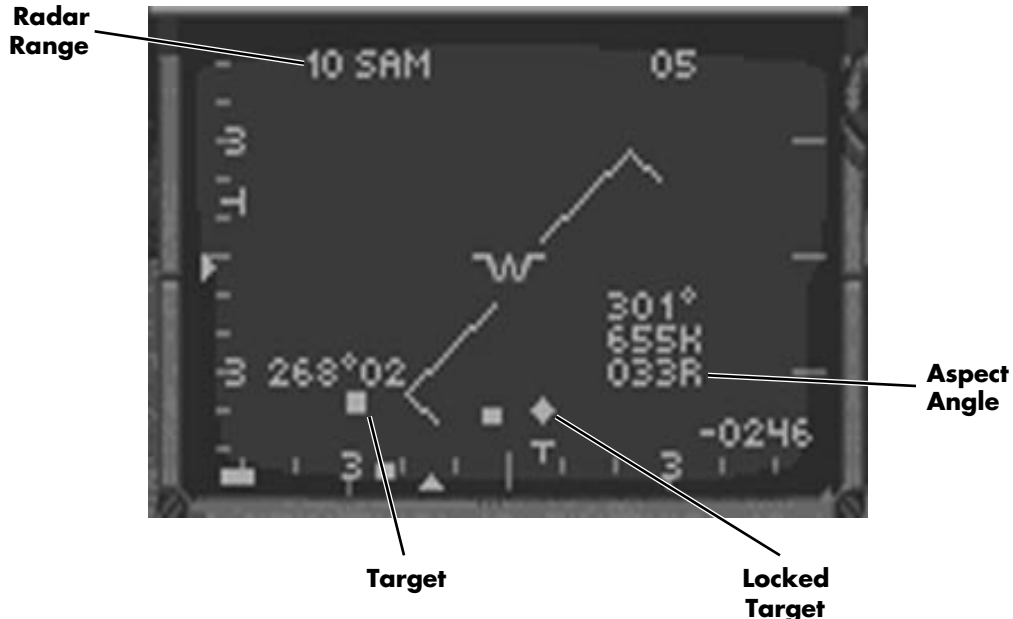
Use the T key to switch among targets on the radar screen. Each time you press T, you will select the next closest target and all the radar readouts will pertain to the selected target.

SAM mode is very useful in determining which bogey might be an immediate threat. You can quickly determine the distance of all the targets on the radar screen by their distance from the bottom edge of the screen. The closer they are to the bottom, the closer they are to you. You can guess their approximate distance by determining how far up they are from the bottom of the screen and multiplying this by the radar range. For example, at a 20 nm range, a blip that is 25% of the way up from the bottom of the screen would be about 5 nm from you.

The T key will provide you with specific information about each target. Most important for determining immediate threat is the aspect angle, the bottom number in the three number stack on the right middle of the radar screen. A target with an aspect angle near 180° is heading directly toward you and is most likely a threat.

High Fidelity Radar – HFR

The High Fidelity Radar mode most closely simulates the working of the real APG-66 radar on the F-16. When you run HFR mode, you must manually control many aspects of radar operations. HFR mode actually consists of four separate modes which you will switch among depending on the kind of tracking and intercept you are doing. You will typically start out in NAM (Normal Air Mode), switch to SAM (Situation Awareness Mode) for details about individual targets, and then switch to STT (Single Target Tracking mode) or ACM (Air Combat Maneuvering mode) when you're ready to engage a target. In addition, you must set the range, the antenna elevation and azimuth scans, and manually select the target you want to look at.

Azimuth and Elevation Scans

In HFR mode, you manually select the pattern that the radar antenna will scan. The antenna scans in two directions: horizontally and vertically. The horizontal scan (called the azimuth scan) is controlled by pressing [F9]. The [F9] key cycles through three azimuth scan angles: 20°, 60° and 120°. You can see the change in scan angle reflected in the antenna azimuth marker (the inverted T) which appears along the bottom edge of the REO. If a target does not fall within the scanned range, it will not appear on the radar screen.
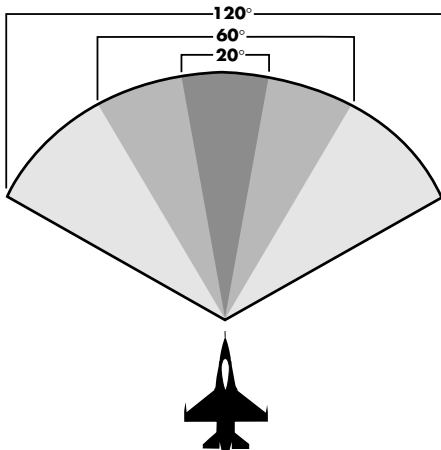
In addition, you also set the vertical or elevation scan. The radar will scan back and forth, and either stay on the same line or move vertically after each scan. Press [F10] to select the elevation scan. The [F10] key will cycle through either 1 bar, 2 bars or 4 bars of elevation scan. In 1-bar mode, the radar scans left and right and stays on the same vertical line. In 2-bar scan, the radar scans to the right, drops down vertically a few degrees, scans left, moves up a few degrees and continues this pattern. In 4-bar scan mode, the antenna scans right, drops, scans left, drops again, scans right, drops, scans left and then moves up to the original scan line.
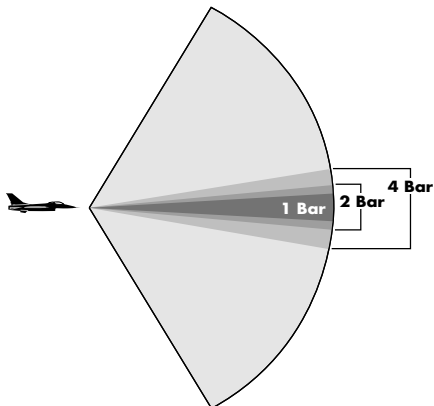
When you cycle through the elevation scan, the elevation ranges that the radar is scanning are displayed as two numbers in the upper right corner of the radar display. The first number is the lower elevation limit, and the second number is the upper limit. For example, if the readout shows 05 25, this means that the radar is scanning an altitude of 5,000 feet to 25,000 feet. Any targets above or below this range will not show up on the radar.

The radar range, scan elevation and scan azimuth settings can all be cycled in the opposite direction by pressing [Shift] in addition to the appropriate function key. For example, to change the radar range from 20 nm to 40 nm, press [Shift][F8] once instead of pressing [F8] three times.

Target blips are updated each time the radar scan hits them. If you are in 4-bar/120° scan mode, you will cover the largest range of space in front of you, but it will take four or five seconds to update each target. If you want continuous information about a target, you will need to narrow the radar scan to hit the target more often.

Target history

HFR mode has a target history feature built in. Each time the antenna scans a target, it displays as a square green blip. The next time the antenna scans the target, assuming the blip has moved, it is painted on the screen in a new position. But the radar keeps the last three positions of each target on the screen, fading each blip over time. The older the blip, the more faded its image. This feature lets you determine how quickly a target is closing or moving away and the relative direction the target is moving. Just look at the trail made by the history blips to get an idea of what the targets are doing.

How to use NAM mode

Press [F5] to select NAM mode. NAM mode defaults to a range of 20 nm. Use [F8] to cycle through different radar ranges. When you are in NAM mode, you will see any targets within the radar scan and distance appear as square blips. In NAM mode, the only readouts on the radar screen are the distance range in the upper left corner and the elevation range in the

upper right corner. Because you have not locked on to a particular target, you don't see the other readouts. However, you can get quite a bit of information about targets in NAM mode.

You can determine approximate target distances by the blip's position from the top of the screen. The distance from the top to bottom of the screen represents the range shown in the upper left corner. For example, in 40 nm range, a blip at the top of the screen is 40 nm away and a blip at the bottom of the screen is on top of you. If a blip is 25% of the way down from the top of the screen, it is approximately 30 nm distant. The target history feature can give you approximate direction and closure information about each blip.

Acquisition Corral and Search Target Altitude Bar

In order to select a target for more information, you need to move the Acquisition Corral on to the target blip. The Acquisition Corral consists of two parallel, vertical lines. Press the T key in NAM mode to cycle the Acquisition Corral to each target on the radar screen. As soon as the Acquisition Corral is placed over a target, the Search Target Altitude Bar will appear on the radar screen. It is a vertical bar that appears next to the left edge of the screen. The Search Altitude Bar is used to determine the approximate altitude of the target in the Acquisition Corral. You read the altitude information from the upper half of the scale on the left edge of the screen. The center tick on the screen is 0 feet, and each subsequent tick represents 10,000 feet. The "3" represents 30,000 feet. The target's altitude is read on the scale across from a small dot in the center of the Search Target Altitude Bar. By moving the Acquisition Corral on to each target with the T key, you can very quickly get an idea of the altitude of each target.

Situation Awareness Mode (SAM)

You can get the next level of detailed information about a target in SAM mode. In this mode, you can lock on to a target to get detailed information about it and still have all the other targets within your scan range appear on the radar screen as they would in NAM mode.

Switch into SAM mode by placing the Acquisition Corral on a target and pressing the Z key.

This locks up the target within the Acquisition Corral and all the radar readouts become active for this target. It also changes the target from a blip to a diamond. If you want to break lock on this target and go back to NAM mode, press the ⌧ (break lock) key. Otherwise, press the Ⓣ key to cycle the lock to each of the targets on the screen. Each of them will show up as a diamond on the REO.

Besides giving you a good overall awareness of what is going on in the sky, SAM mode keeps you more invisible to the enemy pilot's Threat Warning System. Because you are scanning them briefly with your radar, the enemy doesn't get as clear an image of you on their Threat Warning Indicators.

Single Target Track Mode (STT)

Once you've identified a target you believe is hostile, you might want to lock it up for real. Lock up the target in SAM mode so that it appears as a diamond and then press the Ⓩ key again. This switches the radar to STT mode. All other blips disappear, and the radar antenna is locked on the target. You get continuous updates in the readouts, but the enemy may receive a warning that you are painting him with your radar. You trade off continuously updated information for "visibility" to the enemy.

Air Combat Maneuver mode (ACM)

ACM is a special radar mode that automatically locks up the closest target within the radar's scan. ACM mode defaults to a 10 nm range, so you will see and lock up targets that are an immediate threat. If you bank and come in range of another target, ACM mode will automatically lock it up. ACM mode is essentially the same as STT mode, but the range will always be 10 nautical miles and targets will lock up automatically. You will see the radar mode switch from ACM to STT as soon as the target is locked up.

The ACM mode has two scan patterns: 20° x 20° and 10° x 40°. Select ACM mode by pressing F6 and toggle between the two scan patterns by pressing Shift F6. The 20° x 20° mode scans 20° of both elevation and azimuth in one pattern. The 10° x 40° mode scans 10° azimuth and 40° elevation per scan pattern. The 20° x 20° scan is angled slightly downward so it is better for searching out aircraft below your F-16. The 10° x 40° scan is angled slightly upward so it is better for searching out targets above your F-16. When you are using the 10° x 40° ACM scan, a vertical line will appear that is centered on your HUD.

IFF (Identification Friend or Foe)

IFF is a special method of identifying if a radar return is coming from a friendly aircraft or a hostile one. Interrogate the currently locked-on aircraft by pressing the N key. This sends a special signal to the selected aircraft which produces a response from its transponder. If it is a friendly aircraft, its transponder "squawks" back to indicate it is a friendly. If you do not get a squawk, you should assume that the guy is a hostile. If you turn all sound off, you can see if the aircraft is friendly by checking the IFF Light on the Left View.

IFF works in all radar modes.

REO navigation map

The REO map is another navigation tool available on the Radar/Electro-Optical Display. Switch to this map by pressing the C key. When you want to return to the radar, press the C key again.

A small regional map will display with your aircraft as a small red "+" sign. Your home air base is a dark red "x" and your next waypoint is a small green triangle.
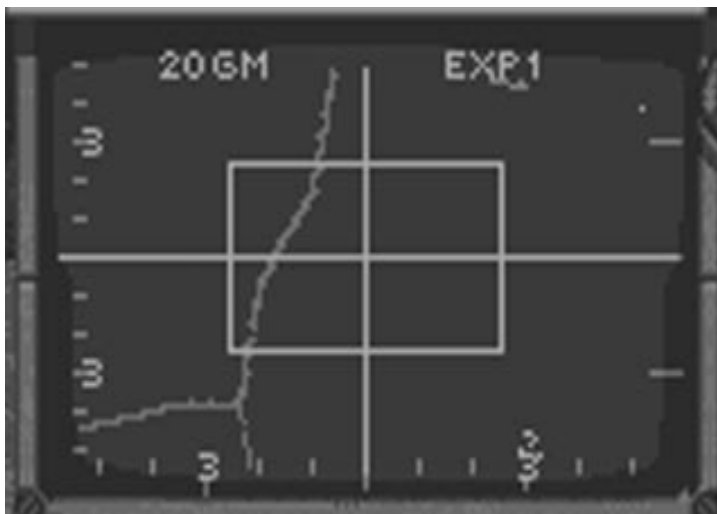
Ground Map mode

Ground Map mode is an air-to-ground radar mode. This radar mode is used to determine your position over terrain, to spot landmarks and to help you locate your targets. Switch to Ground Map mode by pressing F7. You can exit Ground Map mode and return to your previous radar mode by pressing the F7 key again.

Ground Map mode has a fixed range of 20 nm, but it has five levels of zoom. When you select Ground Map mode, the radar will scan the terrain in front of you and display a representation of it on your radar. You can identify some features by color and shape. For example, bright green lines are rivers and dim green lines are roads. Buildings will appear as dots until you get very close. You can also identify runways from the Ground Map mode.

The square in the center of the radar display is your guide for zooming in. If you press the F1 key (zoom in), the area inside the square will fill the entire radar display. Normal ground map mode is 1 to 1. You can zoom in to 2x, 4x, 8x or 16x magnification. Press F2 to zoom back out. Read the expansion value in the upper right corner of the radar screen.

Move the zoom rectangle around in the radar display to zoom in on areas that are not directly in the center of the display. Use the Shift key in combination with the movement keys (I, J, M and L) to move the zoom rectangle to a new position. There are nine possible display positions: three across and three down. Once you position the zoom rectangle on the area of interest, press the zoom in key to see it in more detail.

The target will appear with a diamond or have cross hairs over it on the radar when it becomes visible.

Press the Ⓨ key to toggle off roads and rivers in the Ground Map mode. This can substantially speed up performance.

Outside Views

Falcon 3.0 provides a number of views that give you a spectacular view of the action from outside the cockpit. These views are mostly useful for sightseeing, quick reconnaissance and reviewing previous missions. You may also be able to use these outside views for combat, but in general, they aren't designed for combat.

When you are in any of the outside views, you can rotate the view horizontally and vertically and you can also zoom in or zoom out.

Track View

Track View positions a camera behind your aircraft at a fixed distance. You can use the zoom keys and the rotation keys to view the outside world from any position. To get into Track View, press the ⑨ key on the top row of the keyboard.

If another aircraft is within visual range of your craft while in Track View (or any outside view), the view will automatically change to show both your aircraft and the other aircraft and will continue rotating to keep both aircraft in view at the same time. If several aircraft are within visual range, you can change which plane is kept in view with your F-16 by pressing the Ⓣ key.

Chase View

The Chase View is much like the Track View, but the view from the chase plane is not locked tightly to your F-16 like the Track View is. The Chase plane will lag behind and then catch up to your plane as you maneuver.

Press Ⓞ on the top row of the keyboard for Chase View.

Missile/Enemy View

Falcon 3.0 has some unique views to give you a visual perspective from the point of view of a missile you have just fired or from the enemy target that the missile is heading for. Once you have fired a missile, switch to Missile/Enemy View by pressing the Ⓠ key. It works slightly differently depending on whether you are attacking an airborne target or a ground target.

For airborne targets, the first time you choose Missile/Enemy View, you get the Missile View. You are directly behind the missile heading towards your target. If you press Ⓠ again, you will be switched to Enemy View. This shows you the missile coming toward you from the enemy's point of view. Pressing Ⓠ again puts you into Target View, which shows the enemy target in a view similar to Track View. From Target View you can actually watch your missile hit the enemy plane — if the bandit is not completely destroyed, you'll see it nose over and head, smoking, toward the ground where it will explode in a grand fireball! Once a missile or enemy plane crashes, you are switched back to Track View.

You may also switch directly into Target View by pressing Q once you have locked up an enemy on radar, without firing a missile.

If you are firing an A-G missile, Q works like the first two modes in A-A. The first time you press Q, you are behind the missile heading for your target. The second time you press it, you see the missile coming at you from the ground target's perspective.

Satellite View

The Satellite View gives you a top-down view of your aircraft as seen from a satellite high in the sky. You can zoom in quite close or zoom out to check out the landscape directly under you. By using the rotate keys, you can change the Satellite View to view from any angle and position. Press 1 on the top row of the keyboard for Satellite View.

Ground View

The Ground View is the opposite of the Satellite View. It looks straight up from the ground at your aircraft. By using the rotate keys, you can change the Ground View to view from any angle and position. Select the Ground View by pressing the 2 key on the top row of the keyboard.

Wingman View

You can get an interesting perspective by switching to the Wingman View. This is a view of your plane from your wingman's position. Switch to the Wingman View by pressing the 7 key. If you are flying in a multi-plane formation, the Wingman View is from the pilot listed as 1ST WING in the Armament screen. (Click the button labeled F-16 in the Armament screen to see the names and numbers of your wingmen.) If you repeatedly press the 7 key, you will switch views among each of the wingmen in your multi-plane formation.

Rotation and Zoom

One of the things that makes the outside views so interesting is the ability to change the camera angle by zooming and rotating. Zoom in by pressing the F1 key. Zoom out by pressing the F2 key. To rotate to the left, press the F3 key. To rotate to the right, press F4. To rotate up, press Shift F3. To rotate down, press Shift F4.

Normal rotation is relatively fast. To slow down the rotation, hold down the Ctrl key as you press the other keys.

When you rotate a view around the X or Y axis, the center of rotation is around the plane you are viewing (your plane or your wingman's plane).

Outside views in ACMI

In addition to the outside views during normal flight, you can also switch to the same outside views when reviewing a video tape of your mission in ACMI. While the VCR has buttons for rotation and zooming, you can use the key combinations described above to change outside views. See **Section XI: ACMI** for more information about ACMI.

Padlock View

Padlock View is a view unique to *Falcon 3.0* which will enable you to track an enemy aircraft or enemy missile as it enters visual range. Padlocking a bandit is fighter pilot slang for keeping a visual lock on the aircraft, and Padlock View lets you do just that. When you go into Padlock View, it will center on the nearest visual threat and follow it wherever it flies. Your HUD appears in Padlock View in the correct position when the tracked aircraft flies in front of it, and you can lock on weapons and fire them from within Padlock View.

You can also use the Padlock View to lock onto the runway. This may help you make an efficient turn on the last leg of a racetrack landing pattern. You must be fairly low and close to the runway, however. You should also be wary of becoming disoriented while using the Padlock View so close to the ground.

Switch to Padlock View by pressing ⑧ on the top row of the keyboard or ✳ on the numeric keypad.

When aircraft are identified

Aircraft are identified in Padlock View when they come into visual range. If more than one aircraft is in visual range, you can switch among them by pressing the Ⓣ (Target select) key. Padlock will switch among every plane within visual range, including friendly planes. When there are no aircraft visible, Padlock View will return to inside the front cockpit.

Missile tracking

Incoming missiles can be tracked in Padlock View. Whenever you first switch to Padlock view, the closest missile targeted at your aircraft (if there is one) will be tracked. You can switch the view to padlock or track nearby aircraft by pressing Ⓣ. Pressing Ⓣ, however, will not switch the view to padlock or track a missile. To reestablish missile tracking, you must again press the view key (⑧ for Padlock). (You can also track missiles in the Track View or missiles targeted at your wingmen using the Wingman View.)

Padlock Status
Window

360°
Window

Target Locator
Window

Main Padlock
Widow
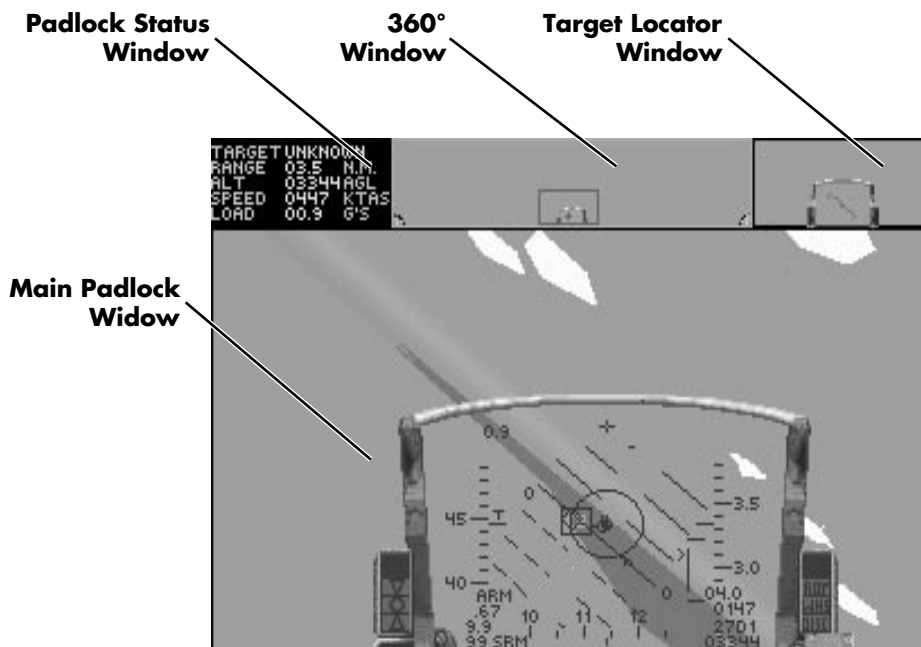
Padlock Status Window

This section is located in the upper left of the screen and displays five lines. The first identifies the target. When you get close enough to identify the target visually, Padlock View will help you confirm your tally ho by identifying the kind of aircraft you are padlocked on. For example, the Padlock View may tell you the aircraft you are looking at is a MiG-29. When no aircraft are visible, the target is identified as NONE. When a target isn't close enough to identify, the target is listed as UNKNOWN.

The other remaining readouts are the distance to the target, your altitude above ground, your airspeed and G load. You may need to refer to this information as you fly in Padlock View. Some of this information is available on your HUD in the Main Padlock Window; however, you will only be able to see the HUD if no aircraft are being tracked or if the tracked aircraft is directly in front of you.

If you are tracking an incoming missile, the missile will be identifed by the following names regardless of the specific missile designation:

✦   ATOLL: a rear-aspect infrared air-to-air missile

✦   MAGIC: an all-aspect infrared air-to-air missile

✦   APEX: a semi-active radar homing air-to-air missile

✦   AMOS: an active radar homing air-to-air missile

✦   SAM (R): a radar SAM

✦   SAM (IR): an infrared SAM

Main Padlock Window

This section of the Padlock screen is the largest and displays the view as you look outside your cockpit and follow the padlocked aircraft. This view will smoothly follow the padlocked aircraft wherever it flies. The only time you will break padlock is if the aircraft flies under your F-16 or it goes beyond visual range. When that happens, the Padlock View switches to any another aircraft, if it is visible. If no aircraft is in sight, the Padlock View finally returns to the forward view, encompassing the HUD.

When an aircraft becomes visible in the Main Padlock Window, a small colored square will be drawn around it to help you spot it. Normally the square is red. If your radar is locked on to this target, however, the square will turn green. If you break radar lock, it will turn back to red. If your radar is locked on a target, try to maneuver so that he comes up in your HUD. You will then be able to fire missiles at him while in Padlock View. However, it's a good idea to use the Padlock View to check your six for another enemy. While you're busy setting up one bandit for a missile shot, another could be ready to waste *you*.

360° Window

The top middle section is the 360° Window. This is a full 360° fish-eye view which shows the HUD in the center and the rear of your aircraft split between the two sides. A red rectangle (known as the Targeting Rectangle), superimposed on the 360° Window, indicates where the Main Padlock Window is looking in the 360° world. The red cross in the Targeting Rectangle indicates the relative position of the target you are padlocked on.

If the Targeting Rectangle is near the HUD, the Main Padlock View is looking toward the front. If the Targeting Rectangle is midway between the HUD and one half of the seat, you are padlocked looking out one side of the aircraft. If the Targeting Rectangle is at either edge near the split seat, you are looking backwards. When your Padlock View looks directly behind you, you will see the tail of your aircraft float in and out of view as appropriate.

Target Locator Window

The upper rightmost section of the Padlock screen displays the Target Locator Window. This window displays an artificial horizon which is very useful since it is quite easy to become disoriented while keeping your eyes on the enemy. You don't want to fly into the ground because you're watching a bogey out the right side of your aircraft.

A HUD is superimposed over the horizon, showing you the horizon from the point of view of looking forward in the cockpit (an artificial horizon bar is drawn on the HUD which parallels the movement of the horizon). However, if the aircraft you are tracking is behind you, the word "REAR" will appear at the top of the Target Locator Window to remind you that the bogey's on your six. The word "BRK" will appear if your speed brakes are engaged, and the word "AB" will appear if your afterburner is on.

You will also see a Target Locator Line drawn on the HUD. You can use this line to help you steer toward your target. If you can bring the nose of your aircraft on the target by following this line, you will see the HUD appear in the Main Padlock Window with the target marked in a target designator box on the HUD. If you switched out of Padlock View to Front View, you should see the same target in the HUD in exactly the same position. See Lesson 8 in **Section VI: Air Combat School** for additional information about the Padlock View.

Takeoff

This section will cover the basics you need to be aware of during takeoff. For a more detailed description of takeoff, see Lesson 1 in **Section VI: Air Combat School**.

Pre-flight cockpit check

You'll want to do a quick check of the cockpit instruments before takeoff.

Left View

- ✦ Check your fuel state. Be sure you have enough fuel for the mission you are planning.
- ✦ Unless you specifically want to record your takeoff, make sure that the AVTR is off.
- ✦ Since you are on the ground, your landing gear will be down. Make sure the Landing Gear Lights show green.

Right View

- ✦ Be sure that no caution lights are lit.

Front View

- ✦ Set up your radar to the range and mode you want. You may choose to turn your radar to standby once you've set it up. Press R to toggle radar from on to standby.
- ✦ Verify your weapons store by pressing the V key to view all on-board stores.
- ✦ Set up the HUD mode you want by cycling through your weapons with the Enter or Backspace keys. The selected weapon will be shown on your stores control panel.
- ✦ Make sure that your jamming pod (if you have one) is off so you don't alert the enemy to your presence.

Once you have gone through your prestart checklist, you are ready to power up your engine.

Takeoff

Initiate your Jet Fuel Starter system (JFS) by pressing the + key and spool your engine up to 60% RPM. You will see the JFS light turn green as the RPM gauge moves to 60%.

Throttle up to 100% MIL power. If you are carrying a heavy load or want to execute a combat takeoff, engage the afterburner (press the / key).

Watch your airspeed on the left side of the HUD. As you reach about 155 kts, pull back lightly on the stick. You will leave the ground. You can monitor your altitude above ground level by looking at the bottom right side of the HUD. Never exceed 200 kts on the ground.

As soon as you are airborne, retract your landing gear by pressing the G key. Verify that the gear is up by looking at your Left View. The green gear lights should be off.

Your angle of climb should be about 20° to 30°. You can verify this by looking at the Pitch Ladder in your HUD. If you are carrying a heavy load, you may not be able to obtain this degree of climb.

Level out when you reach the altitude you desire. If you engaged your afterburner on takeoff, disengage it by pressing the / key.

Landing

This section provides a brief overview of landing. For more detailed instructions, see Lesson 4 in **Section VI: Air Combat School**.

To get ready for landing, switch to the ILS HUD mode by pressing the ⌐\⌐ key. Use the ILS bars to help you line up with the runway. Make sure that the vertical bar (the Localizer Deviation Bar) is centered in the HUD. If it is not centered, bank in the direction of the bar. For example, if the LD Bar is to the right of the Center Point, bank to the right. The LD Bar will move toward the Center Point of the HUD. When it reaches the Center Point, level out. Use your rudders to make fine adjustments to your heading.

Start your approach so that you are lined up with the runway about six to eight miles out. You are going to make a classic racetrack landing: pass over the runway, do a 360° turn and land. If you've got serious damage or are flying on fumes, you may want to do a straight-in landing instead.
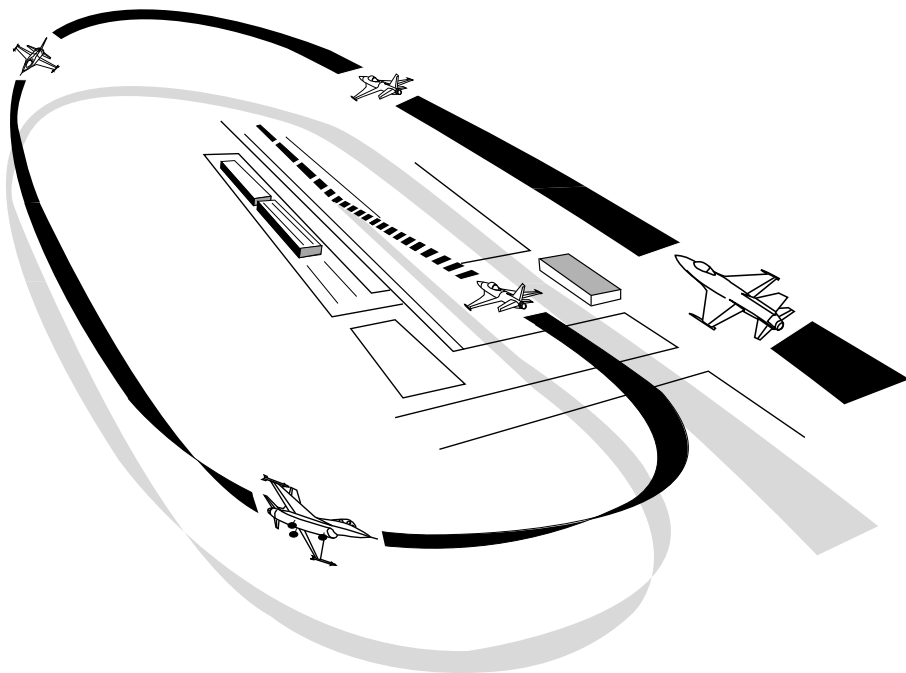
Set your waypoint to your air base to determine your distance. The distance to waypoint on the HUD is displayed under the altitude scale. The waypoint readout shows the distance in nautical miles followed by a "D" and the waypoint number. The waypoint to your home air base is usually the last waypoint set in your navigation system. Use the ⌐Shift⌐⌐B⌐ and ⌐Shift⌐⌐V⌐ keys to change your waypoint. Depending on the level you have set for World Detail, you may be able to see the runway at approximately two miles out. Use the LD Bar and your eyes to line up properly.

Try to be at an altitude of approximately 6,000 ft when you reach the six mile point. This is known as the outer marker. The Glide Slope Deviation Bar will be below the Center Point of the HUD at this time. Your airspeed should be around 300 kts.

As you continue toward the runway, your GSD Bar will ascend toward the center of the HUD. Keep the approach of 1,000 ft for each mile from your airbase. When you are about one mile from the runway, you should be at about 1,000 ft AGL. Continue to descend and pass over the runway at 300 to 400 ft. Continue past the end of the runway at this altitude and start a left-hand 180° turn until you are flying back the way you came. Your airspeed will drop during this turn. Keep it at about 250 kts.

Lower your landing gear during the downwind leg. Be aware that the gear will produce extra drag so you may have to compensate with a slight increase in throttle. Keep your altitude at about 300 ft and your airspeed at about 250 kts. Watch the runway in your Left View. When you pass the beginning of the runway again, do another 180° turn. Give yourself enough room for the base leg turn. If you keep your bank angle the same as it was for the initial break, you will line up perfectly with the end of the runway.

During your final approach, watch your AOA indexer, located to the left of the HUD. The center circle should be illuminated, indicating that your AOA is correct. If the top triangle is lit, you are coming in too slow. If the bottom triangle is lit, your approach speed is too fast. Control your speed and thus your AOA with a combination of throttle, flaps and speed brakes. Your angle of attack will increase as you lower your speed and you want it to be between 10° and 11° at an airspeed of about 190 kts. Be sure not to slow below 155 kts, or you will be in danger of stalling.

Try to touch down near the end of the runway so you'll have plenty of room to land. You want to put the nose dead center on the runway if possible because, if you land off center, you might be in danger of running off the runway. You may have some steering control after you slow down, but if you are too far off center, abort the landing and go around again.

As soon as you touch down, drop your throttle to 40% RPM and hit your speed brakes. When your airspeed drops below 70 kts, you will have steering control via the Nose Wheel Steering system. Use your rudders to keep your plane dead center on the runway. Drive your Falcon to the end of the runway. When you come to a complete stop, set your wheel brakes. To end the simulation after landing, select End Mission from the FILE menu.

If you have to abort because your landing setup isn't the way you want it, don't try to be a hero and land anyway. You'll probably crash and burn, which won't look impressive on your record. Go around again. Eventually you'll get it right.

Menu bar

The menu bar gives you controls over various aspects of the simulation. You can get to the menu bar once you are airborne by pressing the [Esc] key. All menu bar settings (except Scale) are saved from game to game. The configurations you set from the Menu bar override any settings you have made in the Configuration screen. However, the settings in the Configuration screen are used by *Falcon 3.0* each time you run the game.

Using the menus

If you are using a mouse, position the cursor on the menu item and press the button to drop the menu down. Then drag the pointer down the menu to select an individual item. Some menu items have secondary menus that will pop out when you select them. To select an item from the secondary menu, drag the pointer to the right.

If you are using the keyboard, you can select menus and items directly by pressing the letter that is underlined in the menu.

FILE menu

The FILE menu is primarily where you end your mission or exit *Falcon 3.0*.

Return to Game

Return to Game closes the menu bar and returns you to the simulation at the exact spot and time you were at when you pressed the [Esc] key. Any other options you have changed will take effect when you return to the game.

End Mission

End Mission ends the current mission. If you finished by landing, you are taken to the debriefing screen. (In Instant Action, your score is displayed.) If you choose End Mission in the middle of a game, the simulation randomly determines if you survive the mission. You can try to choose End Mission to get out of a hairy situation, but that doesn't guarantee you'll make it back in one piece!

Abort Mission

Abort Mission ends the current mission and returns you to the War Room. Since this acts as if the mission never occurred, use the End Mission option instead if you want this mission to count.

Replay

Replay gives you an instant replay by playing back your video recording for the mission you are flying. The playback starts from the point where you turned on your AVTR to the point you chose Replay. If your AVTR has not been turned on, this option will not be selectable.

Quit to DOS

This menu item quits *Falcon 3.0* and returns you to the DOS prompt. You are first asked to confirm that you want to quit.

CONTROL menu

The CONTROL menu lets you switch between different controllers. You will primarily choose Joystick from this menu to calibrate your joystick.

Keyboard

This option selects the keyboard to be your flight control device.

Joystick

This option selects the Joystick to be your flight control device. This option should be used for any joystick you are using except for the ThrustMaster or CH FlightStick Pro. Those two joysticks need to be selected in the Configuration screen.

Default: This takes the default calibration setting for your joystick.

Recalibrate: This brings you to a calibration sequence to adjust your joystick for flight.

OPTIONS menu

The OPTIONS menu lets you to change game parameters.

Sound

The Sound menu options control the background sound you will hear while flying. Background sounds are engine sounds and the Sidewinder growl.

All Off: This setting turns off all background sounds.

Engine: This setting provides engine noise as the only background sound available in the game. All sound effects can still be heard.

Sidewinder: This setting gives you the Sidewinder growl when you have an AIM-9P or AIM-9M selected and it is tracking a heat source. This lets you know that the Sidewinder is locked on to an aircraft. Engine sound is not produced with this setting.

All On: This setting gives you a combination of engine noise and Sidewinder growl. When this option is turned on, you will get all the possible sounds available in *Falcon 3.0*.

World Detail

These settings determine the level of detail displayed in the world. The higher the level of detail, the more realistic the world looks but the more processing power it takes. If the display is refreshing slower than you would like, reduce the level of world detail to increase the smoothness of flying.

Maximum: This setting shows the most detail. 3-D terrain is displayed with the greatest detail over the largest area.

High: This setting shows more detail. 3-D terrain is displayed with greater detail over a larger area.

Medium: This is the in-between setting for detail. You'll get 3-D terrain, but it is displayed in minimum detail and over a small area.

Minimum: This setting shows the least detail and will give you the smoothest display. At low setting, there is no 3-D terrain.

Terrain

The terrain setting determines whether the topographical terrain is displayed or not. The display of terrain takes up quite a bit of processing power and will slow down the smoothness of the display. If you are engaged primarily in air-to-air combat, you may want to turn off the terrain to increase the frame rate, which will give you a smoother display. This setting overrides the Minimum World Detail setting. For example, if you set World Detail to Minimum and then turn on Terrain, you will get 3-D terrain (similar to Medium Detail).

On: When set to On, the terrain is displayed.

Off: When set to Off, no terrain is displayed.

Collisions

This setting determines whether collisions are possible with other planes and buildings.

On: When set to On, you will crash if you collide with anything.

Off: When set to Off, you may fly into anything, except the ground, without consequence.

Change scale

This option determines the size of aircraft and moving ground objects. Because aircraft are relatively small, if the setting is at 1x (which is real size), most aircraft will be invisible until they are within a couple of miles. Even then, they will appear as dots until they are within less than a mile. Set the scale to 2x or 4x if you want to be able to see aircraft before they are right on top of you. This setting doesn't affect how soon your radar will detect other aircraft.

1x: This setting displays aircraft and moving ground objects at normal size. They will be hard to see until they are right on top of you. If you want a realistic challenge, keep the scale set to 1x.

2x: This setting doubles the apparent size of all aircraft and moving ground objects. You will see them sooner, but enlarging objects doesn't give you a bigger target to hit. This is the default setting.

4x: This setting quadruples the apparent size of all aircraft and moving ground targets. You will be able to see aircraft and other objects from quite a long ways off with this setting.

8x: This setting increases the apparent size of all air targets and moving ground targets by a factor of eight.

Clouds

This option allows you to turn on or off the clouds in the simulation. Turning the clouds off will increase the speed of your game.

On: When set to on, clouds will be displayed at the appropriate altitude.

Off: When this option is off, you will never see any clouds.

Horizon

This option will turn the gradient horizon on and off in the simulation. As with the Clouds option above, turning this option off will increase the speed of your game.

On: When set to on, a gradient horizon will be displayed.

Off: When this option is off, there will be no banded horizon.

G Onset

This option affects how likely you will blackout due to rapid G onset. Blackout can be caused either by continuous high Gs or by sudden G onset, such as going from 2 to 10 Gs instantly.

No Effect: G onset has no effect at this setting on blackout.

Moderate: The effects of G onset on blackout are slight at Moderate, the default setting.

Difficult: G onset plays a major part in determining blackout conditions but not as much as in reality.

Realistic: Blackout from rapid G onset loading is realistic.

CONFIGURATION

Configuration introduction

You can adjust certain game features and customize your hardware options in the Configuration area. For example, if you recently installed a sound card, you should enter the Configuration area and change the settings if needed. The Configuration area has two sections: System Setup and Difficulty Levels.

The System Setup section lets you customize things such as what you are going to use to fly your plane, what sound card you have, etc. The Difficulty Levels section allows you to change variables relating to flying: flight model, amount of armament, effectiveness of weapons, etc. It also has a Realism Value to gauge your setting against others. (In Instant Action, the Realism Value is multiplied by your base score to get your total score.)

The third part of this section will discuss your sound options: what sound boards you have (if any), how to change the options to achieve maximum effectiveness from your board, and the system requirements needed to hear some of the sound effects.

Controls

In all the Configuration screens, you can use either the mouse or the keyboard to make your selections. If you're using the keyboard, the [Tab] key will move you from category to category, the arrow keys ([↑], [←], [→], [↓]) will move to different selections and the [Enter] key will select a specific option. Clicking on one of the top row icons will also change the option below.

Difficulty Levels/System Setup button
In the Difficulty Levels section, this button will read "System Setup." In the System Setup section, this button will read "Difficulty Levels." Select this button to switch between the two Configuration sections.

Cancel button
This button will cancel any changes you have made to the current screen and you will return to the War Room.

Restore button
This button will return all the settings on the screen to the way they were when you entered. You can then begin anew to adjust the settings.

Done button
When you are finished with a particular section and want to keep the changes, click on the Done button to return you to the War Room with all of your changes saved.

Difficulty Levels

This screen allows you to adjust all the variables that relate to flying your aircraft and how certain items work in a campaign setting. To use this screen, simply choose a base Skill Level and then tinker around with the different variables until you find the combination you want to play in.

Realism Value

The number just above the Skill Level options represents the current realism value, in which 1 is the easiest and 100 is the hardest level of play. This number will change as you adjust the options on this screen.

Skill Level

The Skill Level options simply change the other settings on this menu to reflect a pre-assigned default for different skill levels. You can then adjust one or more other options to customize flying on your ability level.

Beginner – This setting changes the other options to reflect an introductory level of play. We recommend using this option for your first few times playing *Falcon 3.0*.

Intermediate – This setting will change the rest of the options to a medium level of play.

Advanced – This setting will change all other options to reflect a high level of difficulty. Note that this option will change the Radar option to HFR (High Fidelity Radar). If you are unfamiliar with the complexities of High Fidelity Radar, you may want to switch this setting to either SAD or SAM.

Custom light

When you adjust any of the options on this screen from the Skill Level defaults, the Custom light will illuminate.

Enemy Logic Level

This option lets you adjust the flying ability of enemy pilots as well as the enemy commander's tactical ability in a campaign.

Trainee – This is the easiest logic level. Enemy pilots will only make maneuvers in the horizontal axis of 6 Gs or less. Enemy commanders may not always choose the best initial strategy and may make tactical mistakes on the battlefield.

Cadet – Enemy pilots will make some simplified maneuvers in the vertical axis, and may make maneuvers of 7–8 Gs. Enemy commanders will choose the best initial strategy most of the time but may still make some tactical errors in battle.

Veteran – With this logic level, enemy pilots will be able to perform all maneuvers in the vertical axis and will be able to pull 9+ Gs. Enemy commanders will always choose the best initial strategy and will occasionally make some tactical mistakes on the battlefield.

Ace – This is the hardest logic level. Enemy pilots will expertly perform all maneuvers in both planar axes and will regularly be able to pull 9+ Gs. Enemy commanders will always choose the best initial strategy and will rarely make tactical errors in battle.

Flight Model

The Flight Model setting allows you to choose how realistically your plane will handle in flight. The Flight Model variables include such factors as lift, drag and weight, dive and climb performance as well as roll rate. If you are new to flight simulators, we recommend starting out with the Simplified flight model.

Simplified – This flight model has been designed with the novice in mind. The controls are similar to an arcade game since the amount of throttle is directly related to airspeed and wind drag is nonexistent. The roll rate is significantly slower than the Complex or Hi Fidelity flight model. This is the least realistic of the four flight models.

Moderate – This is the medium flight model, and factors in such things as lift and drag. The roll rate is significantly slower than the Complex or Hi Fidelity flight model. The handling capabilities are not as realistic as in the Complex or Hi Fidelity flight models.

Complex – The Complex flight model is the most realistic flight model you can have without a math coprocessor.

Hi Fidelity – Designed for use with a math coprocessor (80x87), this flight model is based on an F-16 simulator designed for the Air National Guard. *NOTE: The HF flight model requires a math coprocessor, 80486DX or Pentium to run. If you don't have a math coprocessor, the game will default to the Complex flight model even if you choose Hi Fidelity.*

In addition, your choice of flight model affects blackout and redout. Blackout and redout conditions are defined by pilot G tolerance, maximum blackout duration and degree of control over the plane during blackout.

Flight model	G tolerance	Max duration	Control
Simplified	300% of normal	1 second	Normal
Moderate	200% of normal	1 second	None
Complex	150% of normal	15 seconds	None
Hi Fidelity	Normal	30 seconds	None

Blackout and redout may seem rather sudden under this model. Increasing your G load gradually instead of suddenly will greatly extend this onset time. Your pilot's G tolerance decreases over the course of a mission due to the cumulative strain of repeatedly pulling high Gs. As a pilot's G tolerance decreases, blackout and redout will occur more suddenly and at lower Gs.

Weapon Effectiveness

This option allows you to choose how accurately you must fire your missiles and bombs to hit your intended target. The higher the effectiveness, the further away you can be from your target (building, plane, etc.) and still hit it. The destructive power of each missile or bomb will remain constant throughout these three options.

High – This is the least realistic of the three options. High effectiveness allows you the flexibility to hit within 40 feet of your target and still damage it.

Medium – Medium effectiveness allows you to hit the target within 20 feet and damage it.

Low – This is the most realistic of the three options. With Low effectiveness, you must actually make contact with your target in order to damage it.

SAMs-AAA

This option allows you to adjust enemy SAM and AAA activity. There are four difficulty levels, each of which controls how often SAMs and AAA will fire and how effective their shots will be. Note that if you turn this option to None, your own SAMs and AAA will still be operable.

None – This option turns off all enemy SAMs and AAA. The weapon launchers will remain on the ground, but they will never launch or fire.

Recruits – SAMs will fire rarely, and with little effectiveness; AAA cover will be light.

Reserves – SAMs will fire with some regularity and be moderately effective; AAA cover will be just about average.

Regulars – SAMs will fire regularly, and with above average effectiveness; AAA fire will be heavy.

Elite – SAMs will fire regularly and at long range and almost always hit you; AAA fire will be dense.

HUD

The HUD (Head-Up Display) option allows you to choose between the two different HUD modes available: the F-16A and F-16C. The C option is much simpler to read and use and includes some visual cues to help you out. The A option has an analog Altitude Scale, Heading Scale and Airspeed Scale. Most of the discussion in the manual will be in reference to the A model HUD.

Limited Fuel

This option will allow you to fly with either limited or unlimited fuel. Unlimited fuel allows you to use your afterburners as much as you want without fear of draining your fuel tanks. It also frees you from loading any external fuel tanks for a long mission. If you set this option to OFF, you won't need to worry about your fuel supply in a campaign.

Important note: If you set this option to OFF, the maximum Realism Value you can achieve is 80, regardless of what other options have been turned on.

Limited Armament

This option gives you the opportunity to fly with either limited or unlimited weapons. If this option is off, every weapon is available in an unlimited amount. If you select an unlimited amount of weapons, your drag factor will be as if you have no weapons loaded (see the loading weapons part of **Sections VII** and **VIII** for more details). If you set this option to OFF, you won't need to worry about your weapons supply in a campaign.

Important note: If you set this option to OFF, the maximum Realism Value you can achieve is 60, regardless of what other options have been turned on. In addition, if this is OFF, your enemy kills won't be recorded in Sierra Hotel or your pilot's records.

Limited Chaff-Flares

This option allows you to have an unlimited amount of chaff and flares instead of the standard 30 for each. If you set this option to OFF, you won't need to worry about your supply of chaff and flares in a campaign.

Radar

This option allows you to choose between the three different radar types available for your F-16. These three types vary in complexity with SAD as the easiest and HFR as the most complex. Each type of radar has its advantages and disadvantages, which will be briefly explained below. (For more information on each of the three radar modes, see **Section II: Instant Action** for SAD radar, **Section VI: Air Combat School**, Lessons 5 and 6 for SAM radar or **Section IX: Flight** for SAM and HFR radar.)

SAD – Situation Awareness Display. This radar mode is the simplest and easiest of the three to use. Its main features include a 360° radar scanning mode, simple lock on of enemy targets, and color-coding on the REO for the altitudes of enemy planes.

SAM – Situation Awareness Mode. This medium-complexity radar is also known as "Super SAM" radar. Its main features include an easier version of locking on enemy targets. It also has a longer radar range than SAD mode but only within a 45° cone in front of your F-16.

HFR – High Fidelity Radar. This is the most complex of the three radar modes. With this mode, you will have to manually lock on a target as well as manually switch between radar distances. It may be the most complex of the three, but it is also the most versatile because it allows you to filter radar signals.

Collisions

This option allows you to turn on or off collisions with enemy planes or ground objects. If this option is set to OFF, you will have the security of knowing you won't collide with another aircraft when roaring through a head-on engagement or crashing into a building when you execute a low-altitude maneuver. Turning collisions OFF, however, won't save you from crashing into the ground.

Redout-Blackout

This option gives you the choice to turn on or off the effects of G forces on the aircraft you pilot. When this option is OFF, you can pull 9+ Gs (or -3 and below Gs) for any length of time without blackout or redout. Note that this option does not affect your wingmen (if any) on your flight or any of the enemy aircraft. Note that your flight model selection also affects the degree of blackout and redout.

Campaign

Select Campaign to adjust the degree of difficulty of your campaigns. The three campaign options are ESY (easy), STD (standard) and HRD (hard). The more difficult the setting, the less often you will receive replacements and resupplies. In addition, the mobile air defenses will appear in enemy columns and around enemy targets, and you will encounter more aircraft in enemy formations.

System Setup

The System Setup screen allows you to adjust variables relating to your computer, its sound capabilities and flight control devices. Most of these options have been already configured during installation.

Flight Control

The Flight Control choices allow you to change which device you use to fly your aircraft.

Keyboard – Select this option if you want to use the keyboard as your flight controller. This is the default selection.

Joystick – Choose this option if you plan to use a joystick to control your aircraft. This option should be used if you are using two joysticks, a joystick with a throttle control, rudder pedals, etc. The computer will automatically detect if you have any of these devices installed. If you have a joystick with a separate throttle control (such as the *CH FlightStick* and *Kraft Thunderstick*), you can choose to calibrate the throttle wheel. (Note: if you *do* calibrate the throttle wheel, you will not be able to use the $\boxed{+}$ and $\boxed{-}$ keys to control the throttle.)

CH FlightStick Pro – Select this option to use your *CH FlightStick Pro* joystick.

ThrustMaster – Select this option to use your *ThrustMaster FCS* stick to control your F-16.

Detail Level

Detail Level gives you choices on how much detail you want your 3-D world to have during flight. The program has already selected a default for this option based on the speed of your computer. If you change your Detail Level to a higher one than the computer recommends, you will experience speed degradation.

Minimum – This option has no 3-D terrain and is the fastest detail level setting of the four.

Medium – This selection has 3-D terrain in a limited viewing area.

High – This option has 3-D terrain in a larger viewing area.

Maximum – This gives you the most detail of all the selections. It has 3-D terrain in a vast viewing area.

Bkgrd Sound

The Bkgrd (Background) Sound choices allow you to adjust which background noises will play in addition to any sound effects.

Off – This turns off all background sounds. Use this option if you feel that all these noises are too cluttered.

Engine – This option provides engine noise as the only background sound. Engine noise will not be heard through your PC's internal speaker.

Sidewinder – This option gives you the Sidewinder missile (AIM-9M and AIM-9P) growl when you have those weapons selected. The Sidewinder growl gives you an audible cue when you have locked onto an enemy plane.

Engine-Sidewinder – This combines the previous two options. Depending how sensitive your ear is, this combination of sounds may come out too scratchy. If this is the case, we recommend selecting either the Engine option or the Sidewinder option. With an internal speaker, only the Sidewinder growl will be heard.

In addition to the Sound Effects and Background Sound choices, you can toggle all sound on or off (when in flight) with the ⓢ key.

Radio Messages

See the Sound Options description later in this section for more information on how to use this option.

Sound and Music

See the Sound Options description later in this section for more information on how to use this option.

EMS Settings

The EMS (Expanded Memory System) settings allow you to place some of the game data into EMS in order to reduce disk access. However, to adjust these settings, you must have an expanded memory manager (EMM386 comes with DOS 5.0 or you can purchase a package like QEMM) previously loaded into memory. If you don't have an EMS manager, you can't adjust any of these settings to take advantage of your additional RAM. (For more information on EMS and installation, see **Section III: Installation and Loading.**)

You must remember that, while placing these items into EMS will reduce your disk access, it will also reduce the length of your replay.

Altitude Data
Click on the switch to put all the altitude data for the terrain into expanded memory.

Object Data
Click on the switch to place the ground objects (moving and fixed) into expanded memory.

Music

The music option will turn ON or OFF all music throughout the game. If you turn this option to OFF, you will not hear music even if you have a sound card selected in Sound and Music. If music is set to ON, the type of music you hear will indicate how well you're doing in a campaign.

Animation

This allows you to turn off the animation sequences throughout the game.

Sound options

The following section describes the different sound boards that *Falcon 3.0* supports and how to achieve the maximum results from each of them. In addition, since you are able to utilize different sound options concurrently, these options will be explained in detail.

With an Ad Lib, Sound Blaster or Roland LAPC-1/MT-32 sound card, we highly recommend connecting them to a pair of amplified speakers. This will give you the full effect of our music and sound effects.

Important note: In order to hear digitized sound effects (speech from wingmen and AWACS), you need to have at least 2MB RAM total with 1MB of expanded memory. For more instructions on how to configure your system to support Falcon 3.0 *with EMS, see* **Section III: Installation and Loading.**

No sound board

You have a limited number of options if you don't have a sound card in your computer.

In order to hear digitized radio messages through your computer's internal speaker, the only item you need to select is the PC SPEAKER option from the Radio Messages menu. If you want to hear other sound effects through your internal speaker, choose PC SPEAKER from the Sound and Music menu.

Systems with only 1MB of total RAM and no sound card should set Sound and Music to PC SPEAKER, Radio Messages to NONE and Background Sounds to SIDEWINDER. This will allow you to hear guns, lock-on tones, enemy lock and launch warnings, stall warnings and a caution tone. Digitized voices are not supported on computers without expanded memory (EMS).

Note that the internal speaker cannot play some sound effects and any music.

Ad Lib card

If you have an Ad Lib (or compatible) sound card, we highly recommend connecting the card to a pair of amplified speakers.

For digitized radio messages through your Ad Lib card, you need to select AD LIB from the Radio Messages menu.

You can play music and sound effects through your Ad Lib card by selecting AD LIB from the Sound and Music menu. You will also need to have the Music switch set to ON if you want to hear music.

Sound Blaster card

With a Sound Blaster (or compatible) sound card, we highly recommend connecting the card to a pair of amplified speakers.

For digitized radio messages through your Sound Blaster card, select SNDBLASTER from the Radio Messages menu.

You can play music and sound effects through your Sound Blaster card by selecting SNDBLASTER from the Sound and Music menu. You will also need to have the Music switch set to ON if you want to hear music.

In addition, if you have a Roland sound card as well as a Sound Blaster, you can hear radio messages through the Sound Blaster and sound effects/music through the Roland. Simply select ROLAND from the Sound and Music menu and SNDBLASTER from the Radio Messages menu.

Roland card

The Roland LAPC-1 or MT-32 sound card is the only one of the three sound cards that can be used in conjunction with another sound card. If you have a Roland card and a Sound Blaster, you can play sound effects/music through the Roland and radio messages through the Sound Blaster. As with the Ad Lib and Sound Blaster sound cards, we strongly recommend using amplified speakers with the Roland card.

You cannot hear digitized radio messages through the Roland card; however, you can hear digitized speech through your computer's internal speaker or a Sound Blaster. This way, you can hear sound effects and music through your Roland and radio messages through a different source.

To hear radio messages through your computer's internal speaker, select PC SPEAKER from the Radio Messages menu. For radio messages through a Sound Blaster card, select SNDBLASTER from the Radio Messages menu.

You can play music and sound effects through your Roland card by selecting ROLAND from the Sound and Music menu. You will also need to have the Music switch set to ON if you want to hear music.

NOTE: Falcon 3.0 *is only compatible with the Roland MT-32 and LAPC-1. The game does not recognize any other sound card as being compatible with the Roland.*

ACMI

ACMI introduction

NOTE: ACMI, along with some other game features, is only available if you have expanded memory (EMS) on your system. See **Section III: Installation and Loading** *for more information on using EMS.*

ACMI (Air Combat Maneuvering Instrumentation) has been designed so you can review your combat missions in order to analyze your strengths and weaknesses on the battlefield. ACMI has two major modes: Replay mode and ACMI mode.

Replay mode looks and functions exactly like a home VCR and can play back the action from any vantage point. This mode is useful for showing dramatic combat situations, but sometimes you may want a more tactical view of an engagement. This is where ACMI mode comes into play.

ACMI mode shows all aircraft, ground units, missiles and bullets in a 3-D wireframe environment. The altitude, speed and heading of every aircraft can be displayed with altitude and contrail lines. This information can be used to analyze your missions.

In both modes, you can frame forward, fast forward or skip to any point in the mission tape. You can also view the action through any of the nine standard views or from an independent camera. There is no sound, however, while you are viewing your replays.

How to get here

You can access ACMI from three areas: in the War Room, while flying or from Debriefing. To enter ACMI from the War Room, simply select the ACMI monitor, third from the bottom left. While in the simulation, select Replay from the GAME menu. (When you select Replay from the menu bar, you can view only the current mission tape.) From the Debriefing in the Red Flag or Campaign, select the button labelled ACMI.

How to save ACMI info

Before using the ACMI, you will need to save some in-flight mission data by using the AVTR (Airborne Video Tape Recorder) on your F-16.

When you are flying and are ready to start saving data, press Ctrl R. Your AVTR will continue to save data until its memory becomes full or you turn it off by pressing Ctrl R again. The amount of data the AVTR can save at one time depends on how much EMS you have. Each megabyte of EMS available will give you about 20 minutes of replay.

Immediately after ending the mission, you will be prompted to enter a filename for the replay tape. This will save it to disk for later review.

AVTR Status Light

To check if your AVTR is on, switch to the Left View. The AVTR Status Light is just below the Landing Gear Lights. If it displays "ON," your AVTR is recording the action.

AVTR Tape Indicator

Below the AVTR Status Light is the AVTR Tape Indicator. This is a bar that indicates how much tape time (which depends on the amount of EMS left) you have remaining. After you turn on the AVTR, the green bar will begin to tick down from right to left. When the bar completely disappears, the tape is full and the replay data will start to overwrite the beginning of your tape. Pressing Ctrl S will save all data currently in EMS to disk and then reset the AVTR Tape Indicator to zero.

Replay indexes

Whenever you turn off the AVTR by pressing Ctrl R a second time, this segment of the tape is marked with an *index*. Each tape is composed of one or more indexes. When you have finished flying the current mission, all the indexes will be combined into one tape. Since you cannot have more than one mission per tape, after you stop flying, your tape is complete and no more indexes can be added.

Using index markers, you can play your mission tape in chronological order or skip to a certain section of the tape. You can simultaneously make your mission tape more dramatic and save on EMS by turning on your AVTR only when you are in a dogfight or approaching your mission target.

Loading a replay

If you're entering ACMI through the War Room or Debriefing, the first thing you'll see is the Load/Save dialog box. This is where you select a replay tape to load. The keyboard commands for selecting a tape are:

L Load a tape   ↑ Move up one tape   Pg Up Previous page of tapes

S Save a tape   ↓ Move down one tape   Pg Dn Next page of tapes

Esc Cancel and return to previous area   Tab Will erase filename and allow new name

Once you have selected a tape to view, you will be in Replay mode.

To save part of a replay while flying around, hit Ctrl S. This will bring up the Load/Save dialog box. Here, the Erase AVTR button will clear your AVTR of all replay information and allow you to begin the replay from scratch.

Standard controls for ACMI/Replay

A number of controls and displays on the Control Panel are common to both ACMI mode and Replay mode. You can either use the mouse to press the button on the Control Panel or use the equivalent keyboard command. These controls are arranged spatially around your computer's keyboard in roughly the same pattern as on the Control Panel.
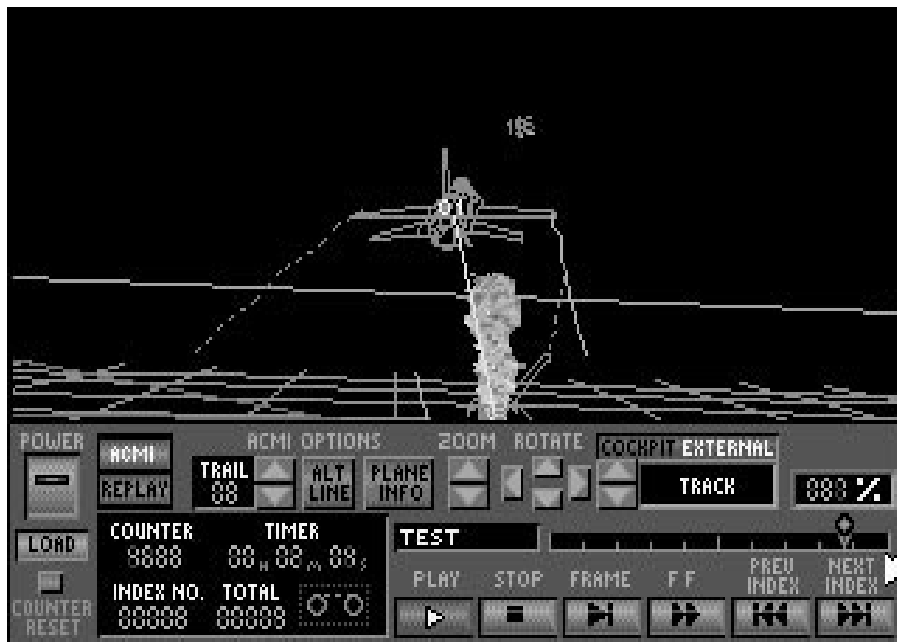
Power

Click this button or press [Esc] to return you to the screen you came from (War Room, the simulation, Red Flag or Campaign).

Load

Click this button or press [L] to bring up the Load/Save dialog box, which gives you the opportunity to view a different tape.

Counter Reset

Press [C] to reset the counter on the left side of the Control Panel to 0000.

ACMI/Replay

These two buttons switch between the two different viewing modes. The keyboard equivalent is the [Tab] key.

Counter

This fluorescent green LED display shows the current position of the replay tape.

Timer

This LED indicator shows the current time of your tape in hours, minutes and seconds.

Index No.

This indicator, below Counter, displays the current index number.

Total

To the right of Index No., this readout shows the total number of indexes in your tape.

Tape Status Indicator

This light, to the right of Total, will flash as the tape is played.

Zoom

When you are in an external view, you can zoom in and out with these buttons. The keyboard equivalent to these buttons are the [F1] and [F2] keys.

Rotate

When you are in an external view, you can rotate around your aircraft with these buttons. Press [F3] to rotate left and [F4] to rotate right. To rotate up and down, press the [F5] and [F6] keys.

View Selection

These buttons let you select the viewing mode. Press Cockpit to switch to views inside the cockpit; press External to change to the outside views. Then press the up and down arrows to toggle through the different view options.

The keyboard equivalents are similar to ones inside the simulation: 1 for Satellite View, 2 for Enemy View, 3 for Front View, 4 for Left View, 5 for Rear View, 6 for Right View, 7 for Wingman View (if applicable), 8 for Missile View, 9 for Track View and 0 for Independent View.

Independent View

This outside view allows you to view the action from any vantage point. When in this view, the following keys (in addition to the rotate keys) are applicable:

↑	Move camera forward	↓	Move camera backwards
←	Move camera left	→	Move camera right
Pg Up	Move camera up	Pg Dn	Move camera down

Replay %

Above Next Index, this readout displays the percentage replayed of the entire tape. Note that the Replay % is not based on the total time of the tape. See the Tape Scale description for more details.

Tape Name

Above the Play button, this window displays the filename for the current tape.

Tape Scale

The Tape Scale, to the right of the Tape Name, shows the tape's position as a percentage of the total number of indexes on the tape. The left side of the scale represents the beginning of the tape, while the right side is the end. You can drag the tape indicator to any position on this scale to view the action starting from that point.

The Tape Scale has been divided into as many parts as you have indexes on the tape. For example, if you have four indexes on the tape, the first 25% of the Tape Scale will be Index 1, the second 25% of the tape will be Index 2 and so on. Since indexes can be of different lengths, some sections of your tape may seem to move quickly, while others may move slowly (e.g., Index 1 may be 15 minutes while Index 2 may be 10 seconds).

To move the tape indicator with the keyboard, press the P key. Then use the ; and ' keys to move the tape indicator left and right. When you have the indicator in the position you want, press the P key again to start the tape playing.

Play

Select this button or press V to play the tape.

Stop

Use this button or press B to stop the tape at the current position. This is more akin to a Pause button since it freezes the action temporarily.

Frame

The Frame button is used to advance one frame at a time. Holding this button down or pressing N will frame forward rapidly

FF

You can use this button or press $\boxed{M}$ to fast forward through the tape. The tape will continue to fast forward until you select the Play, Stop or Frame keys.

Prev Index

Use this button or press $\boxed{<}$ to move to the previous index on your tape.

Next Index

Click on this button or press $\boxed{>}$ to move to the next index on your tape.

Hide control panel

To hide the control panel (and thus get a larger viewing area), hit the $\boxed{\text{Enter}}$ key.

Replay mode

As mentioned previously, Replay mode is very similar to a standard VCR. You can watch your action from all the standard views in addition to the independent view. You can use Replay mode to see what errors you may have made in reading your instruments and learn from that experience. Replay mode is probably most useful for showing off your exciting dogfight to your friends.

ACMI mode

The ACMI mode has been designed to review your combat engagement so you can tactically analyze your performance. ACMI mode is set in a 3-D wireframe environment where you can see the path of every plane and missile. This mode is primarily used to review your maneuvers and tactics so you can improve on them.

ACMI options

Some features,which are listed below, can be used only in ACMI mode:

Trail

The two buttons to the right of Trail shorten or lengthen the colored contrails coming from each plane's wings. Contrails trace an aircraft's path and show yaw, pitch and roll. An aircraft's right wing has a green contrail, and its left wing has a red contrail. Press $\boxed{[}$ to increase the contrail length and $\boxed{]}$ to decrease the length.

Alt Line

When the altitude line is turned on, it will show a line extending from the center of all planes and missiles to the surface of the terrain. This is useful for gauging distance from the earth and for judging relative altitudes of aircraft. Press either the Alt Line button to the right of the Trail button or press $\boxed{\text{F7}}$ to toggle the altitude line on and off.

Plane Info

Selecting this button will bring up a series of numbers next to each aircraft within viewing range. These numbers are the number of the aircraft (ID), the aircraft's altitude (A), speed (S) and heading (H). The aircraft you actually flew will always be aircraft #1. Press either the Plane Info button to the right of the Alt Line button or press the $\boxed{\text{F8}}$ key to display the

Plane Info window. You can move forward through the different planes by pressing the F9 key and backward with the F10 key. Yellow info indicates friendly aircraft, while brown info indicates enemy aircraft.

Using the ACMI

To study a dogfight, locate that segment on the tape. Start the tape replay, lengthen the contrails and play the tape. Stop the tape at the end of the engagement. You can then examine the flight path more closely using the independent outside view. After grasping the action as a whole, step through it at a few frames at a time to see the relative timing of the maneuvers of the different aircraft and missiles.

Since the contrails extend from the aircraft's wingtips, you can see how an aircraft reacted in a situation. Twists in the contrails indicate rolls, bends signify turns. In addition, whenever you have a radar lock on an enemy aircraft, a yellow line will extend from your aircraft to the enemy aircraft.

If you have trouble identifying an object in the 3-D wireframe mode, switch to Replay mode for a better view.

COMMUNICATIONS

Communications introduction

When you think you've mastered the solo game, another challenge awaits you in *Falcon 3.0:* communications play.

With *Falcon 3.0's* Communications mode, you can challenge your friends to a head-to-head duel or combine forces to take on the enemy in either a single mission or as part of an entire campaign. With a Novell NetWare-compatible local area network (LAN), you can dogfight against multiple people or fly joint missions with human wingmen.

For information on head-to-head play with *MiG-29* and *Hornet: Naval Strike Fighter* pilots, see the "Connecting with MiG-29 or Hornet" section.

Important note about LANs: Your Novell NetWare-compatible LAN must be Novell IPX protocol compatible. Falcon 3.0 *is not NetBIOS compatible. You also must have your network drivers loaded into high memory.*

Hardware and software requirements

To play in Communications mode through direct-connection or modem, you need the following equipment:

✦ Either a null-modem serial cable (hooked up between the serial ports on the two computers) or two Hayes-compatible modems (with a baud rate of at least 2400 baud each)

✦ A registered copy of *Falcon 3.0* installed on each computer

To play in Communications mode through a Novell local area network, you need the following equipment:

✦ An expanded memory manager that can load your networking software into high memory

✦ A Novell NetWare-compatible LAN with network nodes and networking software (loaded into high memory) on each of the computers that will participate in the multiplayer *Falcon 3.0* game

✦ A registered copy of *Falcon 3.0* on each computer
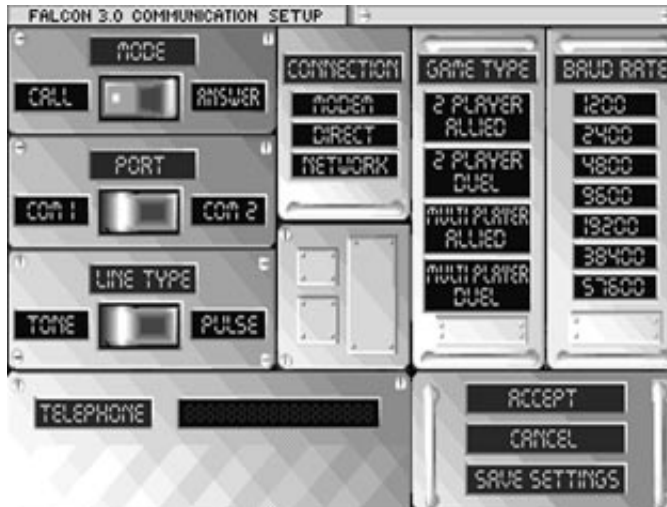
Types of communications play

Two player allied
In this mode, two players connect with each other (through modem, direct-connect or network) and play a campaign. Both players will be flying for the same side.

Two player duel
This mode allows two players to connect (through modem, direct-connect or network) and battle each other until one or the other is destroyed. The only aircraft in the air are you and your opponent.

Multiplayer allied
With this mode, from two to five players (over a network only) can combine forces to play a campaign mission.

Multiplayer duel
The last mode allows from two to five players (over a network only) to shoot it out until only one aircraft is left "standing." You and your friends will be the only aircraft in the skies, so anything is fair game.

Setting up for communications play
Each player needs to do something before they can access Communications mode.

Modem
If you are using a modem, have it plugged into your COM port and turned on.

Direct-connect
If you are connecting two computers, you need to hook a null-modem serial cable to the serial ports on the two computers.

Network

If you are connecting through a Novell network, each player must have the appropriate network hardware and software drivers installed on their computer. When connecting through a network, everyone must have their network drivers loaded into high memory before running *Falcon 3.0*. Also, *Falcon 3.0* must be run from the local computers, not from a network server.

Finally, each player needs to load *Falcon 3.0*.

Preparing for communications play

Before play begins, the players involved must choose which player will be the Caller. In the two-player modes, one player will be Caller and one will be Answerer. In the multiplayer (network) modes, one player will be the Caller and everyone else will be Answerers. In allied mode, the Caller will be the person who chooses the theater and plans the missions.

Before setting up communications between computers, communicate with the other people. Talk to all other players before setting up the game to coordinate the game session. Decide who is running which software, who is going to be the Caller, who will be the Answerer, what baud rate everyone will be set to, when and how the connection will be established, and so forth.

Once the connection starts, there are two visual cues to let you know what is going on. The first is a small spinning wheel, which is an indication that the program is working and has not locked up or crashed. The second is a series of white and red dots which appear on the screen. A white dot is an expected information packet; a red dot represents a packet which has been sent and received.

The following directions should be followed by each player in the communications game:

1. Select a squadron and Theater using the procedure described in **Section IV: War Room.** (Note: the Caller will choose the Theater of play.)

2. Select the COMMS monitor in the War Room. This will bring you to the Pilot Transfer screen. (You can also get to the Pilot Transfer screen from the Squadron Ready Room.)

3. Choose the pilot you wish to fly from the monitor in the upper right-hand corner.

4. Select the Comms button (not the Done button) just below the monitor to bring up the Communication Setup screen.

Caller's responsibilities and actions

The Caller will choose what game to play, which theater to use for allied missions and sets some of the difficulty settings used by all players. (For allied missions, the Caller must also perform all the mission planning.)

The following table shows which difficulty level settings are set by the Caller and which are set by each individual Answerer:

Difficulty Level	Caller	Answerer
Enemy logic level	✔	
Flight model		✔
Weapon effectiveness	✔	
SAMs-AAA	✔	
HUD		✔
Radar		✔
Limited fuel	✔	
Limited armament	✔	
Limited chaff-flares	✔	
Collisions	✔	
Redout-blackout		✔
Campaign	✔	

Communication Setup screen

The Communication Setup screen is where you make your choices for Communications mode. Move around this menu by using the mouse or the [Tab] key and the arrow keys ([↑], [←], [→] and [↓]). Use the [Enter] key or the mouse button to select an option.

Mode

The player who was chosen as the Caller should select CALL, while any other players should select ANSWER.

Port

Choose COM 1 or COM 2 depending on where your modem or null-modem serial cable is. If you are connecting through a network, this option is not used. *Falcon 3.0* does not support COM 3 or COM 4.

Line Type

This option is only used when you are using modem connections. Select TONE if you have a touch-tone phone and PULSE if you have a pulse-dialing (rotary) phone.

Telephone

The person who is the Caller should type in the telephone number of the other player here (don't put any hyphens in the number). This option is used only for modem connections.

Connection

Choose the appropriate selection for your communications game, either MODEM, DIRECT or NETWORK.

Game Type

Select the appropriate game type from this menu. You have the choice of one of the four listed previously: 2 PLAYER ALLIED, 2 PLAYER DUEL, MULTI PLAYER ALLIED or MULTI PLAYER DUEL. All players must select the same game type.

Baud Rate

Select the baud rate applicable for your connection.

Modem connection: You need to choose the lowest common baud rate for the two modems (for example, if one modem is 9600 baud and the other is 2400 baud, both players must select 2400 baud).

Direct connection: We recommend using a speed of 19200 baud for direct connection.

Network connection: The baud rate in a network connection indicates the *amount* of data being transmitted rather than the *speed* of the data being sent across. We recommend using a baud rate of 19200. If the game runs too slowly, use a lower baud rate; conversely, if other aircraft are not moving smoothly enough, use a higher baud rate.

Accept

This will accept all entries you have made and start you going in Communications mode. If the other player(s) have not pressed the ACCEPT button, you will get a message telling you that the computer is waiting for the other player(s) to finish.

Cancel

This will cancel any changes you have made to this screen and bring you back to the War Room. If you want to reenter Communications mode, you will need to select the COMMS monitor and repeat the pilot selection procedure.

Save Settings

If you plan to use the settings on the Communication Setup screen more than once, you may want to save the settings for later use. After selecting the SAVE SETTINGS button, you will begin the connection process.

Connecting in Communications mode

Modem

Two-player duel and two-player allied games can be played via modem. When setting up a modem connection, be aware that the connection process begins as soon as the ACCEPT or SAVE SETTINGS buttons are selected.

- ✦ Before connecting, be sure that both players have selected identical settings for Connection, Game Type and Baud Rate.
- ✦ The Caller should have Mode set to CALL, and the Answerer should be set to ANSWER.
- ✦ The Port and Line Type should be adjusted as appropriate for your situation.
- ✦ The Caller should enter the Answerer's phone number in the Telephone window.

When all settings are satisfactory, both players should select ACCEPT or SAVE SETTINGS.

Note: *Falcon 3.0* only supports the COM 1 and COM 2 serial ports for communications and does not support data compression (v32, v42, v42bis MNP).

The Caller will then receive a dialog box asking to "USE MODEM DEFAULTS" or not. If you need to input some special Hayes AT commands (or your telephone credit card number), you can input them after you type N. Otherwise, simply press Y and continue with your connection. Your modem will then begin to dial and establish a link to start your communications session.

The modem defaults consist of a series of Hayes AT commands. If you decide to bypass the default string, you may enter your own modem commands of up to 60 characters in length. If you wish to use a phone number longer than 18 characters or are having difficulty establishing a connection, you should use this option.

You can also use the default commands in addition to your own. Press Enter to send the command appearing in the box to the modem. The default modem commands are automatically entered into the first few boxes, but you may alter them if you wish. To replace these commands with your own, press Backspace to erase the default command and then type the desired alphanumeric string in its place (up to 60 characters). When you are ready to exit the command entry session, press Enter at a blank command line box.

To use the command mode to enter a long phone number, for example, you would press N to bypass the automatic hookup, but press Enter to send the default commands until you reach an empty command line box. Type in the phone number, including any credit card codes, into this box and then press Enter twice to send the phone number to the modem and exit the command entry session. The modem will then try to connect. Refer to your modem manual for more information on the Hayes AT command set.

Modem problems

If you have trouble connecting, you may need to change the modem initialization commands to suit your modem. When it asks if you want to use the default settings, press N. The initialization command lines are the ones that read "ATZ" and "ATE0V0Q0." Replace one or both of these lines as appropriate for your modem.

If replacing the initialization command lines does not work, try the following:

1. Use a communications program (such as *ProComm* or *QModem*) to dial and establish a communications link between the two computers.

2. Quit the communications program. Do not hang up the phone line or otherwise break the modem connection.

3. Run *Falcon 3.0* as before, choose a squadron and select the Comms monitor to bring up the Communication Setup screen.

4. Select DIRECT under the Connection menu and set the Baud Rate and Port to the proper settings for the modem.

5. Choose ACCEPT or SAVE SETTINGS to start play.

If you follow this procedure, the game will treat the connection as a direct serial hookup.

Direct

To play a two-player game by direct connection, you must connect the two computers through either the COM 1 or COM 2 serial ports using a null-modem serial cable. Be aware that the connection process begins as soon as the ACCEPT or SAVE SETTINGS buttons are selected.

- ✦ Before connecting, be sure that both players have selected identical settings for Connection, Game Type and Baud Rate.
- ✦ The Caller should have Mode set to CALL, and the Answerer should be set to ANSWER.
- ✦ The Port should be set to COM 1 or COM 2 as appropriate for each computer.

When all settings are satisfactory, both players should select ACCEPT or SAVE SETTINGS. This will establish the communications session.

Network

When playing over a network, up to six players can fly at once. Since *Falcon 3.0* only supports Novell's IPX standard (version 3.10 or later), all players must be connected to a Novell NetWare or Novell NetWare Lite network. NetWare users should be sure to use version 3.22 or later of the NETX or EMSNETX programs.

Note: If you are using IPX.ODI from NetWare Lite, you will not be able to connect more than two players on the network.

All players should talk to each other beforehand and decide what all the settings will be, when to join, who is flying which game, and so forth. Be aware that the connection process begins as soon as ACCEPT or SAVE SETTINGS is selected.

In a network game, there is only one Caller. All the rest of the players are Answerers. The basic procedure is:

1. Before connecting, be sure that all players have selected identical settings for Connection, Game Type and Baud Rate.

2. The Caller should have Mode set to CALL, and the Answerers should be set to ANSWER.

3. When all settings are satisfactory, the Caller should select ACCEPT or SAVE SETTINGS. The Answerers should follow by clicking on ACCEPT.

After each player hits the ACCEPT button, the Answerers must wait until the Caller chooses them from a list on his computer. (The Caller must use the arrow keys and Enter to select an Answerer's *log-on name* from the list. A player's log-on name is the name he uses when logging on the network. With NetWare Lite, the other players will be listed as question marks.) If the Answerer agrees to play, a star will appear in front of his name on the Caller's list. Once the Caller has chosen the players he wants to play with, he should select the word EXIT at the top of the player list. This will begin the comms session.

During the connection process, the two computers will transmit data back and forth. This is indicated by a series of colored boxes above the words "RECEIVING SATELLITE DOWNLINK." As long as the boxes continue to appear, the computers will be transmitting data. The entire procedure can take several minutes.

Before entering the simulation, each player using a joystick will be asked to calibrate it. When this is done, the game will begin.

Duel game

In the two-player and multiplayer duel modes, the objective is to shoot down all of your opponents. (This is similar to the single player Instant Action mode.) When there is only one player remaining, the game will end and all players will be brought to the high scores screen. After they press a key to exit the top ten screen, each player will be asked if they wish to play again. At this time, they will either begin another communications game or exit to the War Room. If there is only one player who wants to play a duel game, the communications session will be terminated.

All players in a duel will be armed with four AMRAAMs, two AIM-9Ms, two AIM-9Ps and an ECM pod. However, if the Caller has Limited Arms turned off on the Difficulty Levels screen, all players will have every available weapon in unlimited quantities.

Allied game

Allied games allow the players involved to participate in campaign missions. Once all players have been selected by the Caller, they will be brought to the War Update screen, just as in a single player campaign. From here until the time each player enters their plane, the Caller will make *all* the mission decisions. The Answerers can see what is taking place, but they will have no control whatsoever about waypoints, flights or even the weapon load of their aircraft. The Caller is the Squadron Commander, while the Answerers take the part of other pilots in the squadron.

You will be unable to set an altitude or speed for waypoints in Communications mode. This is because all the other players control their own actions. Any computer-controlled planes will follow the leader of their flight.

On the Assign Pilots screen, all the players will be automatically assigned to aircraft with the Caller leading the flight.

After the Caller has selected the Takeoff button from the Load Armament screen, the mission will begin. All the Answerers will start off *in the air,* so they should wait for the Caller to take off.

Ending a mission

The Caller is the only player who can end the mission. Other players can abort from the current mission, but this is highly discouraged. It will leave their plane flying in a straight line. When the Caller ends the mission, the mission will end properly.

Since the menu bar is deactivated during Communications mode, the only way to End Mission is Alt Q whereas Abort Mission is Alt A. If a Caller or Answerer chooses to exit to DOS by pressing Alt X, the game will respond as if they aborted the mission.

Other Communications notes

Disabled features

The menu bar, accelerated mode, redout and blackout, video animations and ACMI are disabled in Communications mode.

Pause key

Only the Caller can pause the game while everyone is flying around. Answerers will be unable to pause the game.

Chat feature

If you want to send over a radio message to the other player(s) in your flight, press the ⌐ key. This will allow you to send over a message of approximately 60 characters in length. You can use the [Backspace] key to correct mistakes. Press [Enter] to send the message to all other pilots on your flight. The game will continue to play while you're typing your message. (Don't send long messages when you've got a MiG on your six!)

Menu bar

As mentioned previously, the menu bar is disabled in Communications mode. The Caller can end a mission by pressing [Alt][Q]. No Answerers can end a mission. A Caller or Answerer can abort a mission (and return to the War Room) by pressing [Alt][A]. Hitting [Alt][X] (to exit to DOS) will act as if you aborted a mission.

Ejecting

Ejecting is not allowed when playing a communications game.

Identifying friend or foe

It's important to note that the IFF Indicator will see all similar aircraft as friendly in a duel. Therefore, all F-16s will see other F-16s as allies, regardless whether you are fighting in a duel or not.

Radar

If you turn off your radar, your F-16 will not show up on any Threat Warning Indicators.

Troubleshooting and tips

⭢   All players should be running the same version of the game for best results.

⭢   Make sure the baud rates of the connected computers are the same. When using a modem, make sure that the line type of the calling computer is set correctly.

⭢   If you are having trouble connecting using a modem line, try using the custom modem command box. (*Falcon 3.0* expects a simple modem configuration without special features like hardware compression or hardware handshaking.)

⭢   Another method for connecting over a modem is to first establish a connection using a communications program like *ProComm*, exit that program without hanging up the modem and then start *Falcon 3.0*. At the Communication Setup screen, select **direct-connect** through the comm port attached to your modem to complete the link.

⭢   Although you can continue an allied campaign, you have to copy squadron files from one slot to another using DOS. After you exit the game after a communications campaign session, the campaign information is stored in the SQUAD6 files. To save your allied campaign, you must copy these files to the permanent squadron files. To save your campaign to SQUAD0, for example, type **copy squad6*.* squad0*.*** [Enter].

If there is another squadron stored in the SQUAD0 files, it will be overwritten. (The permanent squadron files are numbered from 0 to 5.)

A batch file has been provided to do this for you. Type **savecamp** [Enter] at the DOS prompt to copy all the SQUAD6 files into SQUAD0.

✦ If the connection is accidentally broken in head-to-head mode, there is a possibility that squadron data will get corrupted. For safety's sake, create a new squadron when entering head-to-head mode. This will provide the most reliable results in head-to-head mode, as well as protect existing squadrons that are involved in a single player campaign. We have provided a batch file that will replace all squadrons with freshly generated ones and will also delete any corrupt files that may been been created. Type **f30reset** [Enter] at the DOS prompt to delete damaged squadron files and replace them with new ones.

Warning: Using the F30RESET utility will destroy any saved campaigns and all existing squadron information.

Connecting with *MiG-29* or *Hornet*

If you or your friends have *MiG-29* or *Hornet*, you can play head-to-head games with them, each of you flying your respective aircraft. Two players can fly together or against each other using a direct connection, modem or Novell NetWare-compatible network. Two to six people can play over a Novell Netware network.

There are many ways to join with other players in head-to-head games. The three basic scenarios for head-to-head play are:

✦ Duels, where all players are adversaries

✦ Campaigns, where players cooperate against the enemy

✦ Campaigns, where players on one side battle players on the other side

Both scenarios accommodate all three game programs simultaneously. For instance, in a six-player campaign, two of the players might run *Hornet*, two *Falcon 3.0* and two *MiG-29*. This situation is a multigame scenario. Naturally, single-game scenarios, in which all players use one game program, work fine.

When you combine the possibilities for games and scenarios, you come up with these types of head-to-head encounters:

✦ Single-game duels

✦ Multigame duels

✦ Single-game campaigns

✦ Multigame campaigns

The final variable is the number of players. Each situation in the above list can accommodate two to six players.

Duels

A duel is a free-for-all in which one player emerges victorious. The game continues until a single aircraft remains or until all the players quit.

In a duel, all *Falcon 3.0* and *Hornet* players will automatically be armed with four AMRAAMs, two AIM-9Ms, two AIM-9Ps and an ECM pod. All *MiG-29* players will be armed with two R-27Rs, two R-73s and two R-60s. If the Caller has Limited Arms turned off on the Difficulty Levels screen, all players will have every available weapon in unlimited quantities.

In a multiplayer duel, the IFF Indicator recognizes which players are friends and which are enemies. If you're a Falcon or Hornet pilot, your IFF recognizes Falcons and Hornets as friends and MiGs as enemies. MiGs appear as friendly to other MiGs, with Falcons and Hornets as the enemy.

Multigame (*Falcon 3.0* vs. *MiG-29* or *Hornet*) duels

When duelists use different game programs (*Falcon 3.0, MiG-29* and *Hornet*), there are some extra considerations for setting up a head-to-head encounter.

The main rule to remember is the one about the Caller's game. That is, if there are any *Falcon 3.0* players, one of those players must be the Caller. Otherwise, the Caller must be a *Hornet* player. This rule holds for multiplayer duels regardless of the number of players.

If there are any *MiG-29* players in the crowd, the protocol becomes a bit more complex. When MiGs are present, the software divides the players into sides with Falcons and Hornets opposing MiGs. This division is crucial when playing a campaign in head-to-head mode. Even though there aren't any "sides" in a duel, the protocol applies when you set up the communications session.

There is an additional rule of protocol when MiGs are involved. The Caller must invite all Falcon pilots first, then Hornet pilots, followed last by the MiG players.

Furthermore, if two or more players have *MiG-29*, one of them must act as the "Master MiG." The Master MiG's computer is a communications hub for the other MiG players. For this reason, the Master MiG should be the MiG player with the fastest computer.

The next section shows how to combine all of these variables when you set up a head-to-head session with a mixture of Falcons, Hornets and MiGs.

Setting up a multiplayer/multigame duel

Continuous communication between the players is essential to setting up a multiplayer, multigame duel. Everyone should either be within earshot or reachable by phone during the setup. This way, you can coordinate when each person joins the game.

First, each player must decide which plane to fly (that is, which game program to run) and let the others know. When the players agree on who flies what, the next step is to choose a theater. Everybody must agree on this choice as well.

Finally, the players select a Caller and a Master MiG. It's the Caller's responsibility to make sure that the rest of the players join the game in the correct order. The sequence *must* be as follows:

1.   Caller (a *Falcon 3.0* player if there is one)

2.   All other *Hornet* and/or *Falcon 3.0* players

3.   Master MiG

4.   All other *MiG-29* players

Once the preliminary details are settled, and the Caller knows when to invite each player, the communication process begins. It works like this:

1.   Before connecting, all players select the same settings for Connection, Game Type and Baud Rate.

2.   The Caller sets the Mode switch to CALL. All other players select ANSWER.

3.   The Caller clicks ACCEPT.

4.   All *Falcon 3.0* and Hornet players choose ACCEPT or SAVE SETTINGS.

5.   The Caller sees a box with the network names of all the other players. The Caller invites another player to join by choosing a name and pressing OK. The Caller must invite only *Falcon 3.0* players first, and then *Hornet* players second.

6.   After all the *Falcon 3.0* and *Hornet* players have accepted, the Master MiG should then choose ACCEPT or SAVE SETTINGS.

7.   The Caller invites the Master MiG.

8.   Once the Master MiG has accepted, the other *MiG-29* players select ACCEPT or SAVE SETTINGS.

9.   The Caller then invites any remaining *MiG-29* players.

10. When all players have accepted, the Caller selects EXIT to begin play. In a six-player game, play starts immediately after the sixth player accepts.

The *MiG-29* flight leader should click the TAKEOFF button first, followed by the *Falcon 3.0* or *Hornet* leader within 10 to 20 seconds.

Campaigns

In a head-to-head campaign, the players fly missions in a theater of war. Unlike duels, players cooperate against the enemy. If all the players fly on the same side (for instance, if they all have *Falcon 3.0* or *Hornet*), the computer controls the enemy. In a game mixing Falcons, Hornets and MiGs, the players take sides (Falcons and Hornets vs. MiGs).

Each side in a head-to-head campaign has a flight leader. In single-game campaigns, the Caller is the flight leader. In multigame campaigns, the Caller is the Falcon/Hornet flight leader and the Master MiG is the MiG flight leader.

The process of setting up a head-to-head campaign is like the process for setting up a duel. The Caller must invite the players to join in the order shown in the previous section.

Once all the players are in the game, a series of campaign news screens appears. The players will then get their instructions for the mission.

At this point, the other players on each side sit back and watch as the flight leader plans the mission. He or she sets the waypoints, arranges the flights and wingmen and assigns weapons. When the flight leader clicks TAKEOFF, the mission begins.

Each mission in a multiplayer campaign brings both groups of players into contact. For example, if the Falcon/Hornet pilots are assigned to bomb a bridge, the MiG-29 pilots might be assigned to fly CAP (combat air patrol) over that same bridge.

REFERENCE

Glossary/Abbreviations

A-A – Air-to-Air.

AAA – Anti-Aircraft Artillery.

AB – Afterburner.

ACM – Air Combat Maneuvers. Dogfighting tactics involving more than two aircraft.

ACMI – Air Combat Maneuvering Instrumentation. A facility developed in *Falcon 3.0* for recording missions. Named for the U.S. Air Force's equipment for accomplishing the same feat in real aircraft.

ACT – Air Combat Tactics.

Action – the point of the initial position-to-target run where the prebriefed maneuvers is begun. Also the Officer's Club on Friday.

ADI – Attitude Director Indicator. A cockpit instrument that displays an aircraft's pitch and bank angles relative to an artificial horizon.

A-G – Air-to-Ground.

AGL – Altitude above Ground Level.

AGM – American designation for Air-to-Ground Missiles.

Ailerons – aircraft control surfaces, located along the back of the wing, which produce rolling moment.

AIM – Air Intercept Missile.

Airspeed – the velocity of the aircraft in relation to the surrounding air.

All-aspect – weapons that are effective at any angle to the target.

ALO – Air Liaison Officer.

AMRAAM – Advanced Medium Range Air-to-Air Missile. A BVR missile carried by your F-16 Fighting Falcon.

Angels – altitude of aircraft in thousands of feet. "Viper is at angels 23" means that the other plane is at 23,000 feet.

Anti-radiation missile – a missile that homes on radio frequency radiation.

AOA – Angle of Attack. The angle between an aircraft's velocity vector and a reference line pointing straight ahead along the fuselage.

AR/NWM – Air Refuel/Nose Wheel steering system.

Aspect angle – the angle formed by a line running directly to another aircraft and a line parallel to the other aircraft's longitudinal axis.

ATO – Air Tasking Order.

Attitude – the state of an aircraft in terms of pitch, bank and yaw.

Avionics – an aircraft's electronic systems.

AVTR – Airborne Video Tape Recorder.

AWACS – Airborne Warning and Control System.

Bandit – a plane identified as an enemy aircraft.

Bank – the angle of the wings about the longitudinal axis referenced to horizontal.

Beaming – flying perpendicular to the emissions from a threat radar.

BFM – Basic Fighter Maneuvers. What you do to kill the other guy once you are in a fight. BFM implies a single plane rather than a formation.

Bingo – fuel level is such returning to base immediately is required.

Bitchin' Betty – an electronic female voice used in the F-16 to warn the pilot of potentially dangerous situations.

Blackout – a loss of vision or consciousness due to pulling too many positive Gs.

Blip – the image of a radar return appearing on the REO.

Bogey – an unidentified aircraft.

Bracket – an ACM tactic in which two (or more) aircraft fly to opposite sides of a threat formation.

Break – a defensive maneuver used when a plane is attacked from the rear. It is performed by turning sharply into a pursuer's line of attack in an attempt to make him overshoot.

BVR – Beyond Visual Range.

C³ – Command, Control and Coordination.

Callsign – a codename for a particular pilot.

CAP – Combat Air Patrol.

CAS – Close Air Support.

Cat 1, 2, 3 – Load Category, where Cat 1 is the lightest.

Chaff – packets of foil used to decoy or obscure radar systems.

Closure rate – the rate at which a targeted enemy plane is closing on your F-16 (positive number) or pulling away (negative number).

Contrails – trails of vapor in an aircraft's wake. Contrails are generated by high-G turns.

Corner velocity – the velocity at which an aircraft achieves its best turn performance.

Continuous wave radar – a radar that emits a continuous beam of energy. Also known as a doppler radar.

Death Dot – CCIP HUD mode indicator showing where the bombs will hit.

Delta Sierra – Dog Sh*t, meaning "bad." "The weather is Delta Sierra."

Dogfight – a maneuvering air-to-air engagement with an enemy aircraft.

Driver – a pilot flying (rather than navigating) the plane in a two-seater; also used as a term for a pilot in a one-seater such as the F-16.

Duty Roster – the crew chief's list of available pilots.

ECM – Electronic Countermeasures. In *Falcon 3.0,* ECM is in the form of an ALQ-131 pod which is designed to foil ground-based SAM sites and confuse the radar of enemy planes that have locked onto you.

Elevators – aircraft control surfaces, located at the back of the horizontal stabilizers, which provide pitching moment.

Engage – commence BFM.

Envelope – the safe or effective ranges of operation for aircraft or weapons.

E-O – Electro-Optical.

FBW – Fly-By-Wire. A flight control system which transmits flight commands via wires to servo actuators which drive the ailerons, rudders or other control surfaces. In most FBW systems, pilot input is processed and possibly negated by a flight computer before being sent to the control actuators.

FCS – Flight Control System. See also *HOTAS*.

Fighter jock – a slang term for a fighter pilot.

Fire and forget – designates a self-guided weapon.

Flaps – aircraft control surfaces, located at the rear of the wing, which alter the wing profile to provide greater lift at lower speeds.

Flares – magnesium-based packages designed to fool heat-seeking missiles when released from your F-16.

Fly the needles – follow the ILS flight path indicators.

Fox 1 – a radio call from a friendly aircraft announcing the firing of a radar-guided missile.

Fox 2 – a radio call from a friendly aircraft announcing the firing of an AIM-9P Sidewinder.

Fox 2 Mike – a radio call from a friendly aircraft announcing the firing of an AIM-9M Sidewinder.

Foxtrot Uniform – F*cked Up. "My radar is Foxtrot Uniform."

G – the force of gravity.

GBU – Guided Bomb Unit.

GLOC – Gravity Induced Loss of Consciousness.

HFR – High Fidelity Radar.

HOTAS – Hands On Throttle And Stick. A control setup that allows a pilot to perform all actions necessary to dogfighting without removing his hands from the stick or throttle.

HUD – Head-Up Display.

IFF – Identify Friend or Foe.

I'm a dot – I'm outta here, I'm gone. If your wingman says, "I'm a dot," he's left the fight and you're on your own. Among the fighter pilot community, it's come to mean "I'm leaving" (for the O' Club, dinner, etc.).

ILS beam – a composite radio beam broadcasting the optimal landing approach to a runway.

ILS – Instrument Landing System.

Indicated airspeed – the airspeed shown by an airspeed indicator and not corrected for error due to air density variations caused by altitude and temperature.

Intel – Military Intelligence.

I-R – Infrared.

Jamming – the act of confusing enemy radar systems with radio frequency noise.

JFS – Jet Fuel Starter. A cockpit light that turns green to indicate that the engine has started.

Joker – fuel level is such that plans for egress and return to base should begin.

Knots – nautical miles per hour.

Lag pursuit – a combat maneuver where a pursuing pilot aims the nose of his aircraft just outside his opponent's turn circle.

Lead pursuit – a combat maneuver where the pursuing pilot aims the nose of his aircraft just inside his opponent's turn circle.

Load factor – the force acting on an aircraft as a multiple of the force of gravity.

Lock on – to acquire a target with radar for the purpose of firing a weapon.

Mach – a velocity given as a multiple of the velocity of sound under the same atmospheric conditions.

MiG – Mikoyan Gurevich. The founders of one of four major Russian aircraft design bureaus.

MIL – standard power and acceleration measure.

Military power – 100% RPM (thrust).

MRM – Medium-Range Missile.

NATO – North Atlantic Treaty Organization.

Nautical mile – 6,076 ft.

Negative Gs – the force you would experience if you were swung in a circle by your ankles.

No joy – I don't see it [wingman, target, etc.]. The opposite of "no joy" is *tally* or *tally ho*.

Ordnance – bombs, missiles, bullets and other offensive hardware.

Padlocked – to look away would be to lose visual sighting.

Painted – to be illuminated by a search radar.

Pickling – setting a weapon to fire at one specific location.

Pincer – see *bracket*.

Pipper – a small dot at the center of the aiming reticle.

Pitch – the angle of an aircraft's nose above or below the horizon.

Positive Gs – the force you would experience if you were swung in a circle by your wrists.

Pulling lead – purposely aiming in front of an enemy plane while figuring in the distance

to target and the target's speed to insure a hit.

Pulse-doppler radar – a type of radar that emits a pulsed rather than continuous signal.

Punch out – eject.

Pure pursuit – an offensive maneuver where a pursuing pilot matches his opponent's turn circle.

Radar – Radio Detection And Ranging.

Recon – Reconnaissance.

Red Flag – Air Force fighter training program at Nellis AFB, Nevada.

Redout – the experience of pulling too many negative Gs and having the blood pressure in your head increase tremendously, coloring all objects red.

REO display – Radar/Electro-Optical display.

Roll – rotation around an aircraft's longitudinal axis.

RPM – Revolutions Per Minute. The percentage of power being produced by your engine. See *thrust*.

RTB – Return To Base.

S and D – Search and Destroy.

SA – Situational Awareness. The amount of awareness a pilot has about the tactical environment around him.

SAM – Surface-to-Air Missile.

SCP – Stores Control Panel.

Screen – A type of defensive patrol. Differs from CAP in that a screen is flown between the defended area and a threat whereas a CAP is flown directly over the defended area.

Six o'clock – directly behind, a fighter's most vulnerable area.

Sierra Creek – as in "up Sierra Creek without a paddle."

Sierra Hotel – Sh*t Hot, meaning "good." "The weather is Sierra Hotel."

Soft target – a target without armor or other defensive reinforcement, such as infantry, trucks and regular buildings.

Sortie – mission.

Speed of heat – somewhere between the speed of sound and the speed of light. Often used when egressing the target area. The folks back there are no doubt angry, and you'd like to put as much distance between them and your jet as quickly as possible.

Splash one MiG – statement commonly said after successfully downing an enemy.

Stall – an abrupt loss of lift occurring when the AOA increases to the point that the airstream separates from the wing surface.

Statute mile – 5,280 ft.

Stick – a pilot's directional controller.

Stores – anything that can be loaded onto an aircraft.

Sweep – an aggressive patrol into enemy territory.

Tally (ho) – I see it [wingman, lead target, etc.]. Sometimes it refers only to a bandit. See *visual* and *no joy.*

Target bearing – the angle of the target from the front of your F-16. If a target has a bearing of 340°, it is 20° to the left of your F-16's nose. If the target's bearing is 15°, it is 15° to the right of your F-16.

Taxiing – steering your aircraft around while it is on the runway.

TD box – Target Designator box on the HUD.

Thrust – RPM. The amount of power being produced by your F-16's engine. The terms "thrust" and "RPM" can be used interchangeably.

Tone – an audio cue emitted by missile control systems to indicate that the target has been acquired and is being tracked. It is an indication to launch a missile.

True airspeed – indicated airspeed corrected for installation, compressibility and air density errors.

TWI – Threat Warning Indicator.

Vertical velocity – the sink or climb rate of an aircraft.

Visual – I see whatever it is you are describing. Sometimes used to mean "I see my wingie" (or lead) as opposed to *tally,* which then means "I see the bandit." See *tally.*

VMS – Voice Message System.

Waypoint – location of target as computed by the F-16's navigational computer. The waypoint numbers appear in the lower right-hand corner of the HUD.

Winchester – out of ordnance (weapons).

Wingman (Wingie) – flying partner. Combat aircraft usually fly in pairs.

Allied Aircraft

A-4 Skyhawk

UH-60 Blackhawk
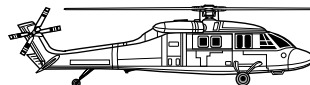
B-52 Stratofortress
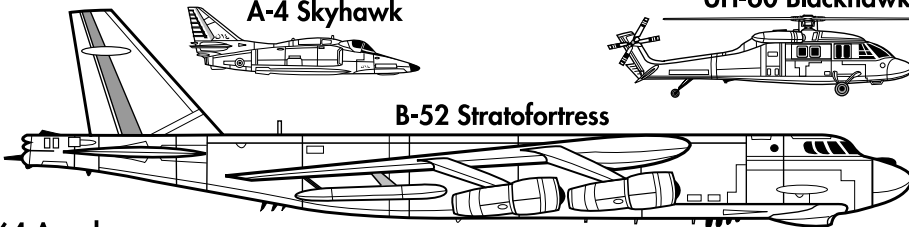
AH-64 Apache

F-4 Phantom

Panavia Tornado

F-117A Nighthawk

A-10 Thunderbolt

F/A-18 Hornet

F-111 Aardvark

ND-88

F-14 Tomcat

Kfir-C7

F-16 Falcon

C-130 Hercules

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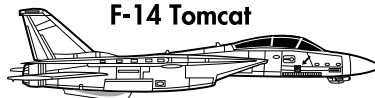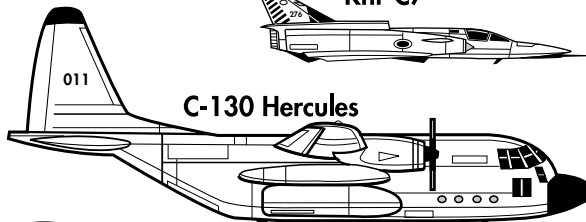
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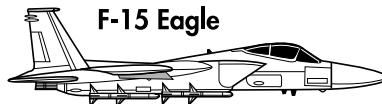
E-3 Sentry
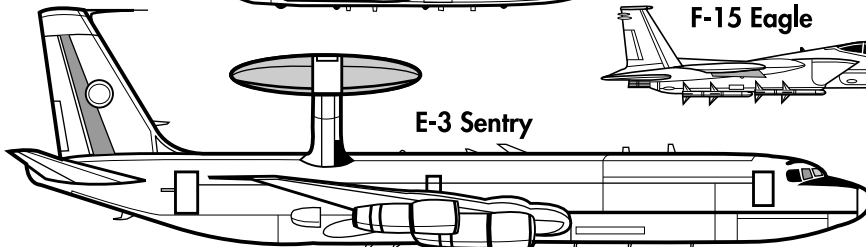
Enemy Aircraft

Mi-24 HIND
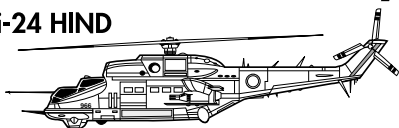
Mirage III

Tu-22 Blinder
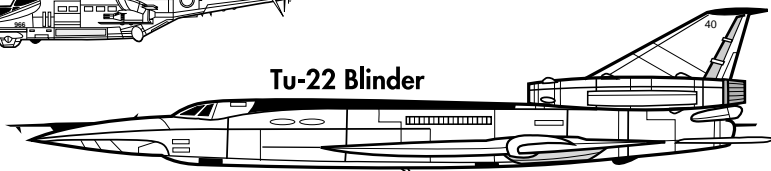
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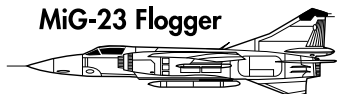
MiG-19 Farmer

Su-25 Frogfoot

Su-24 Fencer
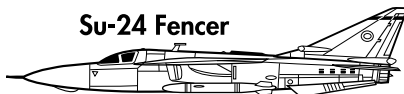
Mirage 5

An-12 Cub
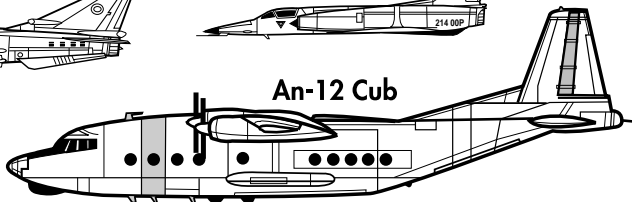
Mirage F1
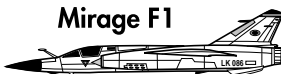
MiG-29 Fulcrum

MiG-25 Foxbat

Su-27 Flanker

SA 342 Gazelle

MiG-21 Fishbed

MiG-27 Flogger
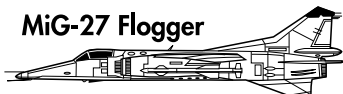
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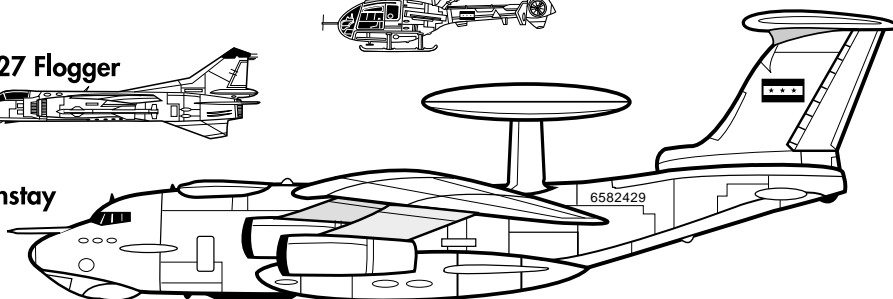
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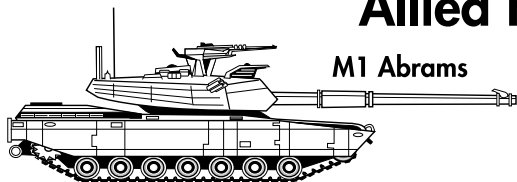
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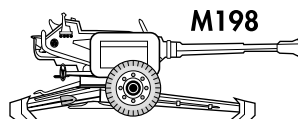
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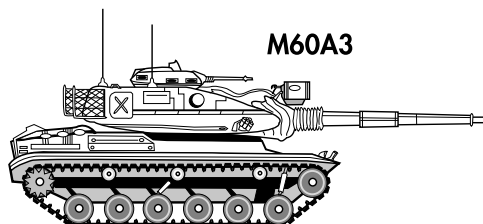
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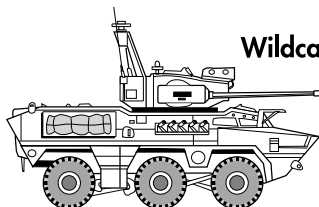
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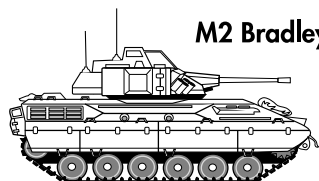
M2 Bradley

Jeep

AMX-13
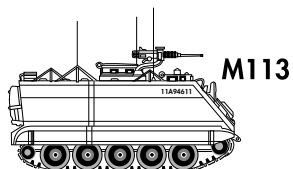
Shahine

Walid

M113
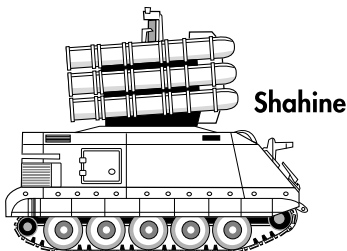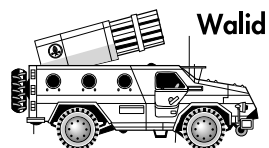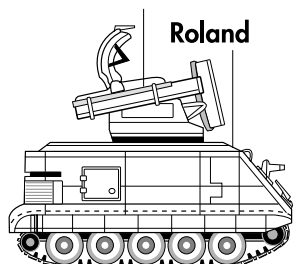
Truck

Roland
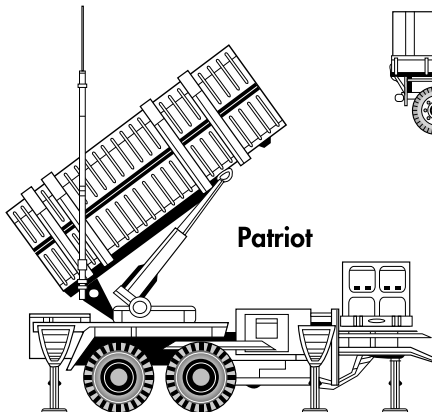
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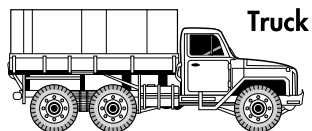
M163 Vulcan

Enemy Forces

D-30
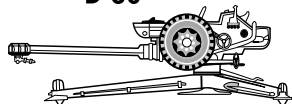
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T-80
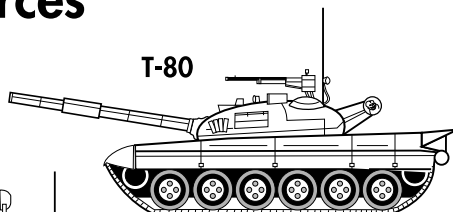
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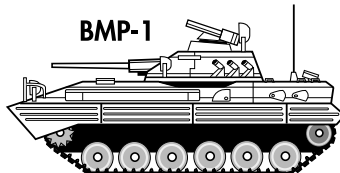
SA-8 Gecko
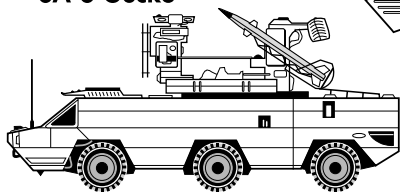
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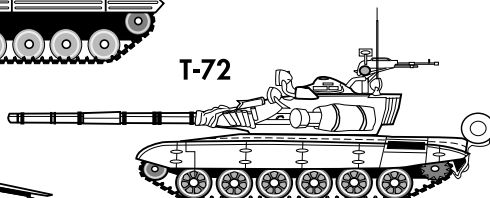
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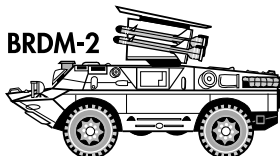
SA-6 Gainful

T-64
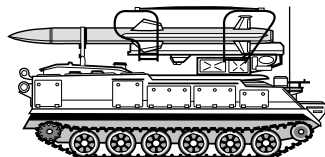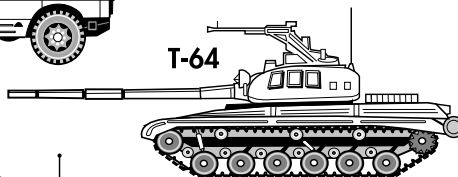
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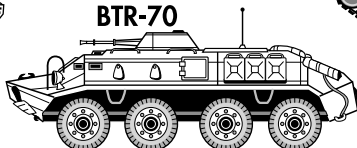
ACRV

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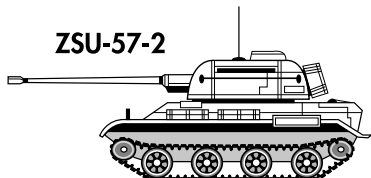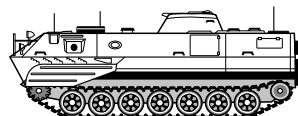
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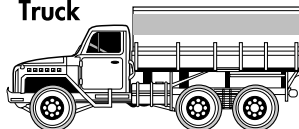
SS-1 Scud

ZSU-23-4 Shilka
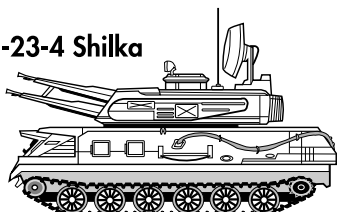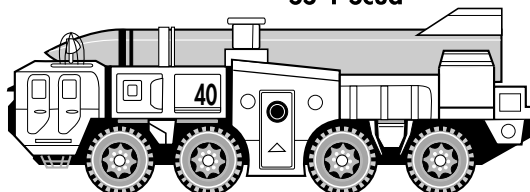
Map icons

⊙	Generic target	Radar site	Radar site		Nuclear power station

Generic target · Radar site · Nuclear power station

Civilian airport · Bridge · Chemical weapons plant

Military airfield · Oil field · Biological weapons plant

Military Air base · Industrial target · Infantry

City · Army base · Mechanized infantry

Town · Railroad yard · SAM

Task force · Missile site · AAA

Naval base · Armor